UNIVERSAL

Used by the Nation's Construction Engineers

Concrete Building Accessories

Catalog No. 300

UNIVERSAL FORM CLAMP CO.
CHICAGO

UNIVERSAL

Used by the Nation's UNI-FORM TRADE MARK *Construction Engineers*

CONCRETE BUILDING ACCESSORIES

WILLIAMS-WALLACE CO.

Manufacturers and Distributors

160 Hooper Street Telephone Hemlock 378

SAN FRANCISCO, CAL.

Catalog No. 300

UNIVERSAL FORM CLAMP CO.

972 Montana Street

Chicago

ON THIS SAME PAGE in catalogue 200, it was stated that "Any device that attempts to save costs or simplify processes in concrete construction, even though little on each job, is effecting enormous savings in the industry when considered as a whole. The application of these devices to his job is deserving of careful thought by every contractor."

These remarks are equally applicable to the contents of this new Catalogue No. 300. The savings effected by Universal Form Clamps and other Universal Products, are appreciable ones on any size of work. As evidence, over 500,000 Universal Form Clamps alone were sold throughout the United States and Canada last year.

In this catalogue on pages 24 to 28 is introduced a new method of hanging forms for concrete from structural steel members. It is a system that has been much discussed, but never before made practical.

All of the following pages are worth looking into.

C O N T E N T S

For Forms and Centering

Rod Clamps
Malleable Washers
Tightening Wrenches
Rod Pullers
Cone Nuts (Couplings)
Rod Couplings (Hexagonal)
Beam Clamps
Adjustable Shores
Complete Tee and L Heads
Post Caps
Band Clamps
Wire Clamps
Soffit Spacers
Metal Cleats
Symons Column Clamps

For Reinforcing Steel

Slab Bar Spacers
Slab Bar Bolsters
Beam Spacers
Beam Bar Bolsters
High Chairs
Bar Chairs
Bar Ties
Tie Chairs
Joist Bar Spacers

• • •

Screed Chairs
Continuous Sleeper Anchors
Anchor Slots
Malleable Inserts
Reed Clips
Brick, Stone, and Terra Cotta Anchors

UNI-FORM
UNIVERSAL FORM CLAMP
TRADE MARK

These arches and columns in this colonnade of a large stadium required very complicated forms. The work was greatly simplified by using Universal Form Clamps.

Form Clamps Adjustable Shores *and* Bar Spacers

Universal Form Clamps

Patented Sept. 1, 1914; Feb. 15, 1916; Aug. 13, 1918.

THE work of tying and hanging forms for concrete is greatly simplified with Universal Form Clamps. They can be used under any conditions and are adaptable to any design of form for walls and columns. These clamps are stocked in five sizes, to take rods from ¼″ to ¾″ in diameter.

On any column of any height, any pier wall or abutment of any size, in hanging soffits, in suspending centering from structural steel, Universal Form Clamps insure accurate forms. They absolutely prevent spreading and thereby save many extra yards of concrete.

A single unit, exceedingly simple in principle and application.

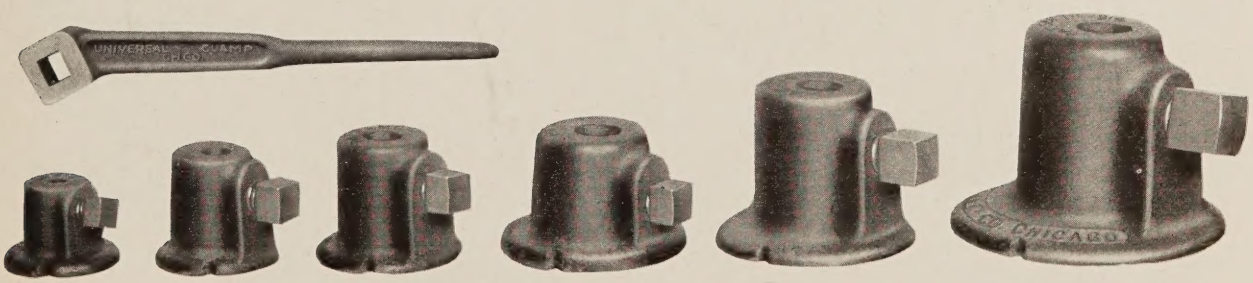
The absence of exposed threaded parts in the clamp itself and the fact that no special threaded rods are required in their use will be appreciated by the man who has had experience with concrete hardening in threaded equipment.

On tapered or battered retaining walls, Universal Form Clamps save the time necessary to plot the various lengths of tie rods as is necessary when threaded rods are used. On a job of this kind, where every rod is of a different length, the Universal Form Clamp has an adjustment equal to the length of rod exposed outside of the forms.

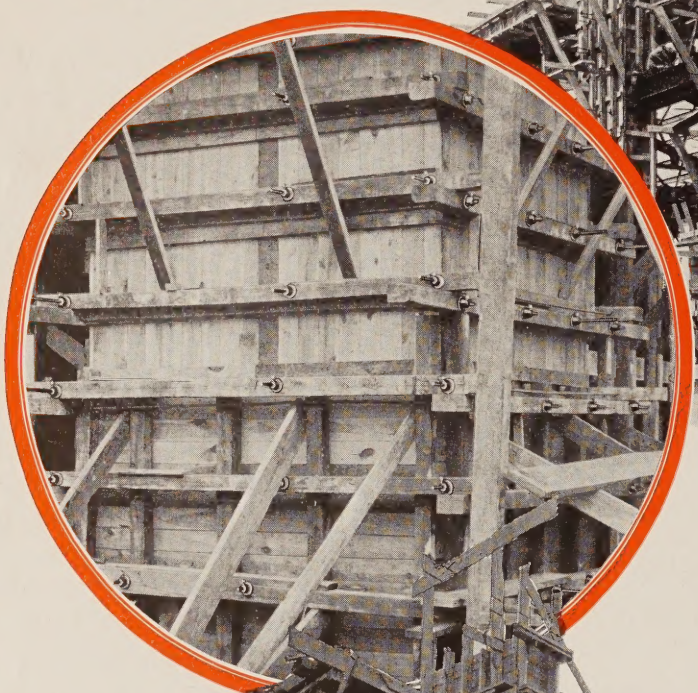
The real economy of the Universal Form Clamp lies in its simplicity and adaptability. These features account for its presence on many of the largest jobs throughout the country. It is very simple in design and very easily fastened in place. Plain round mild steel rods take the place of threaded rods with nuts and washers, or of twisted wire. To apply, the clamp is slipped over the rod, brought to bear against the form and the set screw tightened. The form is moved into line with a Universal Tightening Wrench.

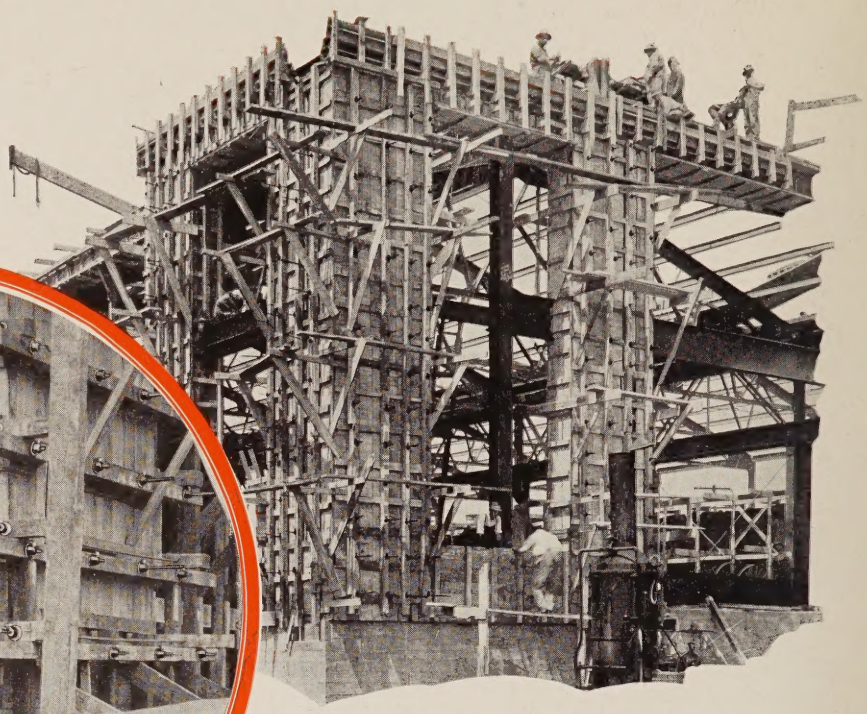
The time-saving qualities of Universal Form Clamps reduce the costs of tying forms to a minimum, and they save time and material when the forms are being knocked down. When they are used with panel forms, the forms can be quickly and easily removed without damaging the panels.

These clamps are equipment in the truest sense of the word. They are adjustable to all jobs and can be used again and again. As a concrete mixer is used on every job regardless of design or construction, so Universal Form Clamps can be applied economically to all concrete work.



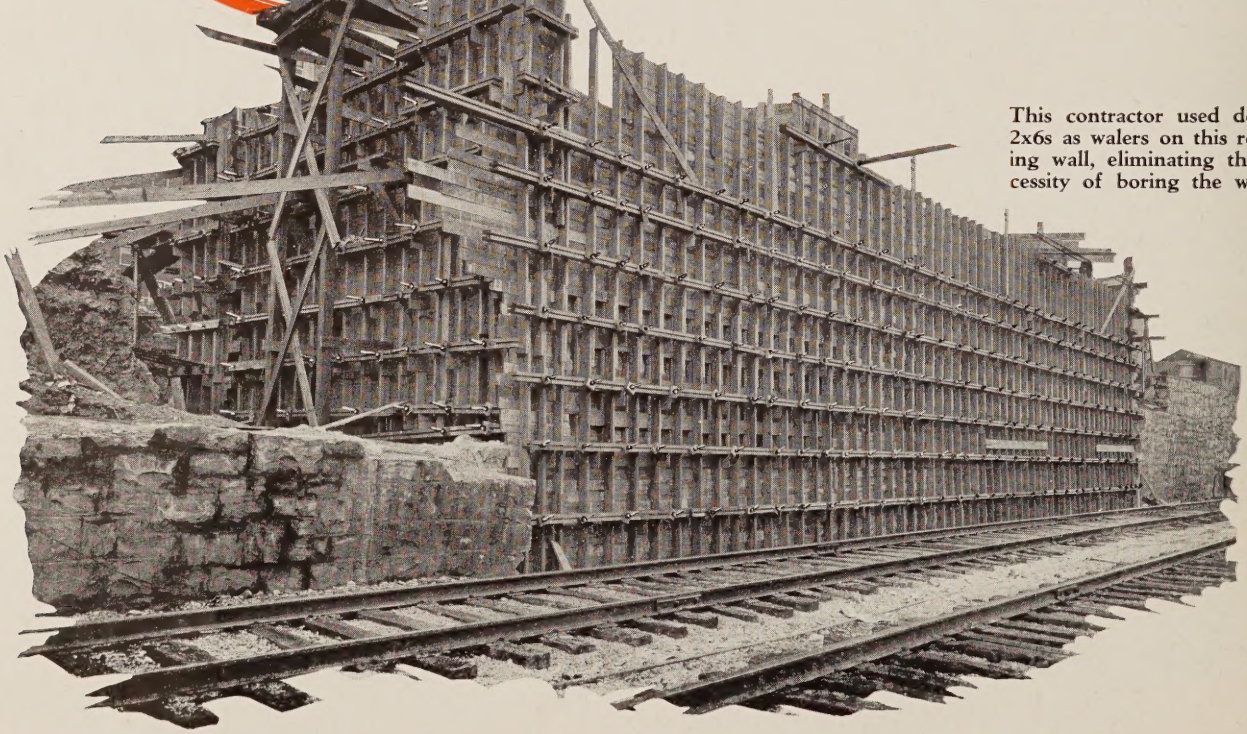
No. 4 clamps with 5/8" rods were used in tying this column, 8' square. The rods were removed with a Universal Rod Puller.

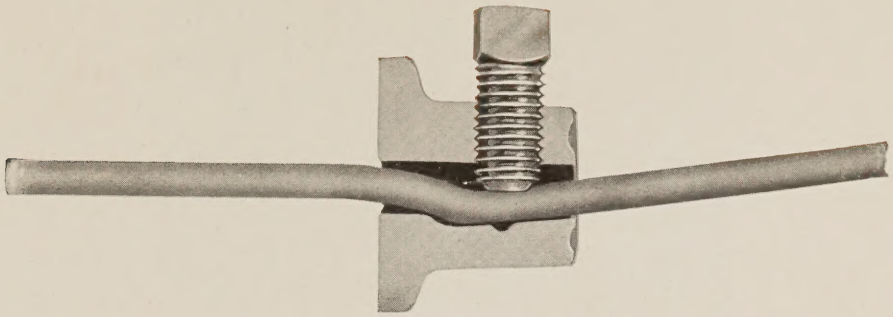




These wall, column and spandrel forms were quickly erected in combination by using the adaptable Universal Form Clamps.

This contractor used double 2x6s as walers on this retaining wall, eliminating the necessity of boring the walers.





The Sure Grip Principle

THE above cross-section shows the simplicity of the Universal Form Clamp. It is a simple patented casting with a flanged bearing surface, an oval hole with shoulders at the small side of opening through which a plain bar is passed. There is a set screw threaded into the large side of the opening and perpendicular to the same, to engage the rod intermediate of the shoulders, so as to depress the rod between the shoulders. The depression of the rod between the shoulders insures the clamp against slipping or moving on the rod. The set screw does not carry the load. It merely holds the rod in the depression, throwing the load on the shoulders of the clamp.

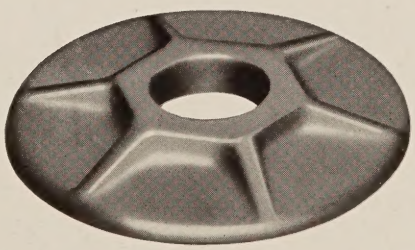
Repeated tests have shown that Universal Form Clamps will hold past the breaking point of 1/4", 3/8" and 1/2" round rods. The 5/8" clamps will take a load of five tons before slipping.

One man can tie up forms with Universal Form Clamps. He simply slips the clamp over the end of the tie rod, jacks the form in line with the Universal Tightener and tightens the clamp in the desired position by turning the set screw. The small wrench shown on page 5 is used for tightening set screws in the clamps. It will be furnished only when specified.

See page 22 for sizes, weights and safe loads.

The Malleable Washer

INSTEAD of boring holes for tie rods, many contractors save that time and labor by using double 2x4s or 2x6s for walers. The tie rods can then be slipped through the walers at any point —saving the time of measuring, spacing and boring the holes. When this method is used with



1/4" or 3/8" rods, the contractor can assure himself sufficient bearing on this split waler by using Universal Malleable Washers. The standard size is 3 3/4" in diameter, for rods from 3/8" to 3/4". Washers 2 1/2" in diameter for 3/8" to 3/4" rods are also carried in stock.

The Universal Tightener is slipped on the rod after the form clamp, the cam is set, and the form lined up by simply turning the handle of the tightener.

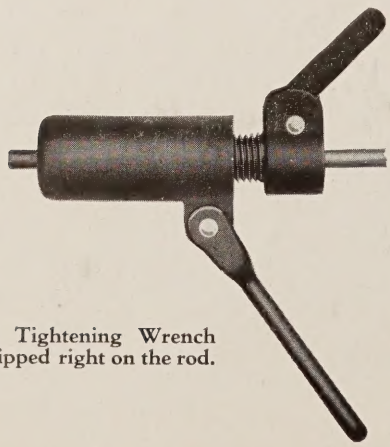
The Tightening Wrench

Patented Oct. 10, 1911; Sept. 1, 1914; Aug. 13, 1918.
Combination of Form Clamp, Rod and Tightener Patented Aug. 13, 1918

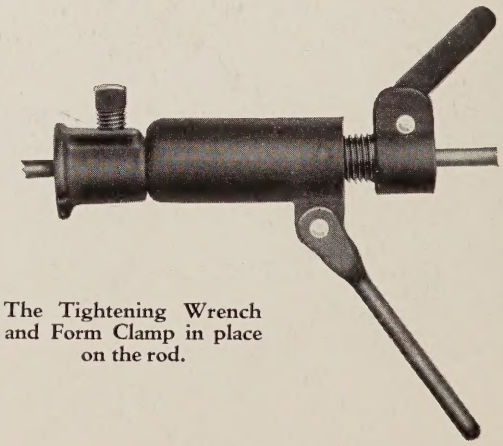
THE TIGHTENING WRENCH is a device used in conjunction with the Universal Form Clamp to exert a pressure against the form to draw it in line, or to desired dimensions. It is placed over the rod after the clamp is on. The tightener is made of four parts—namely, the nut which bears against the clamp, the hollow screw through which the rod passes, a cam and a handle.

The cam is of hardened tool steel and is used for locking the hollow screw to the rod. The slightest pressure against the nut when the cam engages the rod will lock the screw on the rod. For drawing the form together, it is necessary only to turn the handle and unscrew the nut from the screw, the same as with an ordinary jackscrew. When the form is in position, the set screw in the clamp is tightened. Before the tightener is removed, the handle is given a couple of turns backward to relieve the pressure on the cam, after which the tightener is free to remove.

See page 23 for sizes of Tighteners and Repair Part List.



The Tightening Wrench is slipped right on the rod.



The Tightening Wrench and Form Clamp in place on the rod.

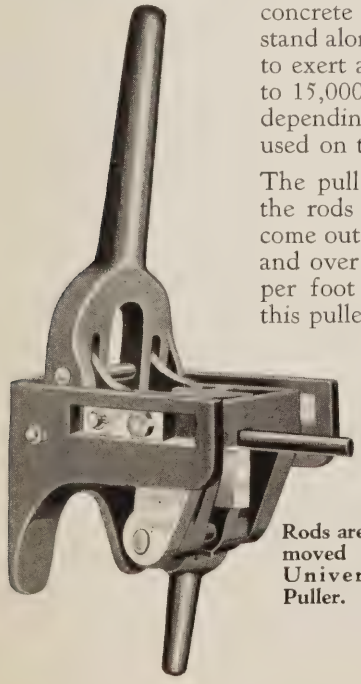
A length of pipe used on the handle of the Universal Rod Puller enables a man to exert from 10,000 to 15,000 pounds pull on the rod. The rods are not bent when they come out.

The Rod Puller

Patented March 27, 1917.

THE ROD PULLER is for the purpose of removing or pulling the tie rods from the concrete after the concrete has set sufficiently to stand alone. The puller is designed to exert a pressure of from 10,000 to 15,000 pounds pull on the rod, depending on the length of pipe used on the handle.

The pull is in a straight line and the rods are not bent when they come out. They can be used over and over again, and the labor cost per foot of removing them with this puller is far less than the cost per foot of new rod. The parts of the puller are all of the highest grade steel castings that can be obtained.



Rods are quickly removed with this Universal Rod Puller.

Rods should be pulled not later than from sixteen to twenty-four hours after pouring the concrete in summer weather where the temperature ranges from 60° up. In winter weather rods can be left in the concrete four or five days. It is almost impossible to lay down a fixed rule as to the exact time of removing the rods. This can be determined very readily by a few trials. **See page 23 when ordering rod pullers and repair parts.**

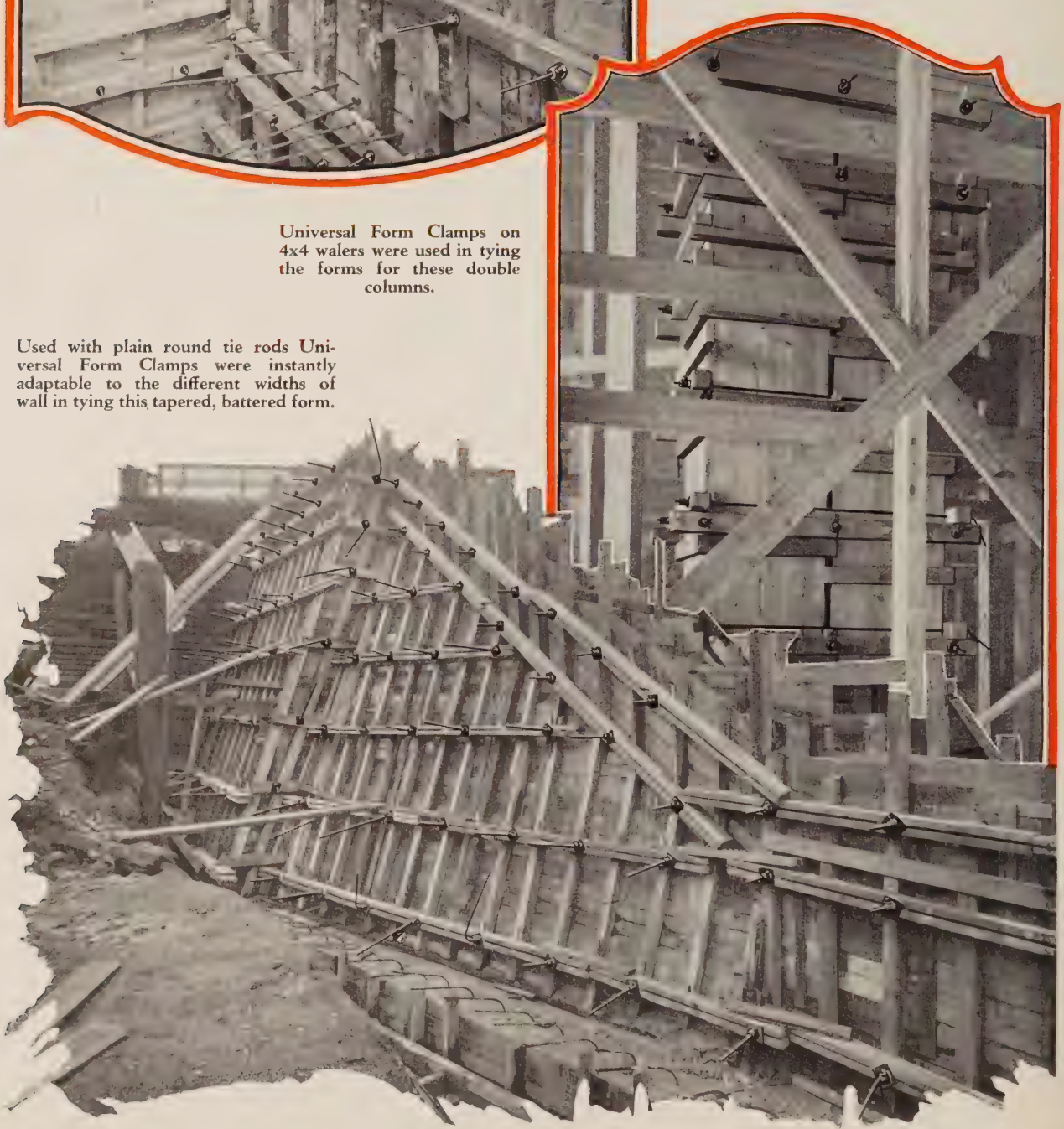
Paper Tubing

When tie rods are to be allowed to remain in the wall for any length of time before pulling, the use of Universal Paper Tubing provides for their easy removal. Its use is also recommended on all walls over 10 feet thick. This tubing, furnished in 4-foot lengths, is made of heavy waxed pasteboard—the ends are easily removed when grouting. It is low in cost and greatly simplifies the removal of rods wherever used.

These heavy foundation forms were tied with Universal Form Clamps.

Universal Form Clamps on 4x4 walers were used in tying the forms for these double columns.

Used with plain round tie rods Universal Form Clamps were instantly adaptable to the different widths of wall in tying this tapered, battered form.



Design of Wall Form

THE accompanying tables for wall forms have been computed for a fluid pressure of 140 lbs. per cu. ft. From 30 to 75 minutes after the concrete is poured it begins to stiffen up so that there is no increase in pressure if more concrete is poured above it. This time which is required for the concrete to stiffen depends on the wetness of the mix and the temperature, being greater for very wet concrete and cold temperatures. For the consistency of concrete ordinarily used and for summer temperature, this time may safely be assumed to be 45 minutes.

In the case of long walls it will not be necessary to fill the forms up rapidly and the height poured within 45-minute periods can be limited to a few feet. In that way the construction of the forms can be greatly cheapened, as they will not have to be made strong enough to hold the full height of wet concrete.

In the case of short walls or piers, it may be more economical to build the forms so that concrete can be poured more rapidly.

Example: No. 1

It is required to design the forms for a wall 2 feet thick and 20 feet high so that the forms can be filled at the rate of 6 feet in 45 minutes (or 8 feet per hour).

The design of the forms is independent of the thickness of the wall, because for a given height the pressure is the same for a thick wall as it is for a thin wall.

Thickness of Sheathing: For ordinary cases ¾″ sheathing will be most economical. The thickness of sheathing is shown on the table on page 12 by the zigzag lines. The ¾″ sheathing can be used for depths down to the top zigzag line. Below that line 1¼″ sheathing is required and below the bottom zigzag line the pressure requires 1⅝″ sheathing.

Spacing of Studs: Using the ¾″ sheathing at a depth of 6 feet, the table shows that the studs can be spaced 14 inches on centers. The stud spacing depends on the strength of the sheathing and not on the size of the studs.

Spacing of Walers: As shown in the tables, the spacing of the walers depends on the size and spacing of the studs.

If 2x4″ studs at 14-inch centers are used, the waler spacing from the top down is given as 6″, 41″ and 26″. The 6-foot depth comes near the bottom of the 26″ space so that spacing should be continued down the wall to the bottom.

If 2x6″ studs are used, the spacing is 6″, 55″ and 32″. The 6-foot depth comes above the center of the 32″ spacing so the next spacing above can be used. With the 2x6″ studs, the spacing can therefore be 55″ for the full depth and with a waler 6″ from the top and one at the bottom, the spacing between would work out to five spaces at about 3′ 11″, requiring in all six lines of waling.

Spacing of Bolts: The spacing of bolts in the walers depends on the size and spacing of the walers and the depth of concrete which is poured above the waler inside of a 45-minute period.

Separate diagrams are given on page 13 for ⅜″, ½″, ⅝″ and ¾″ bolts in 2x4″ and 2x6″ walers so that any desired size of bolt may be used.

In using the diagram for bolt spacing at the top waler the waler spacing is to be taken as the distance from the top waler to the next waler below. For all other walers the waler spacing should be taken as the average of the spaces next above and below the waler in question. The depth of waler should be taken as the distance from the top of the concrete down to the waler, but need never exceed the depth to which concrete will be poured within 45 minutes.

Then assuming the walers to be double 2x6s and spaced as determined for the 2x6″ studs, the spacing to be used for the top waler is 3′ 11″, or 47″. Enter the diagram for 2x6″ walers and ⅝″ bolts at the left-hand side with the waler spacing of 47″. Follow the horizontal line over the curve marked "Depth of waler 6 inches" and then vertically down to the scale at the bottom where the bolt spacing is found to be 75″ for the top waler.

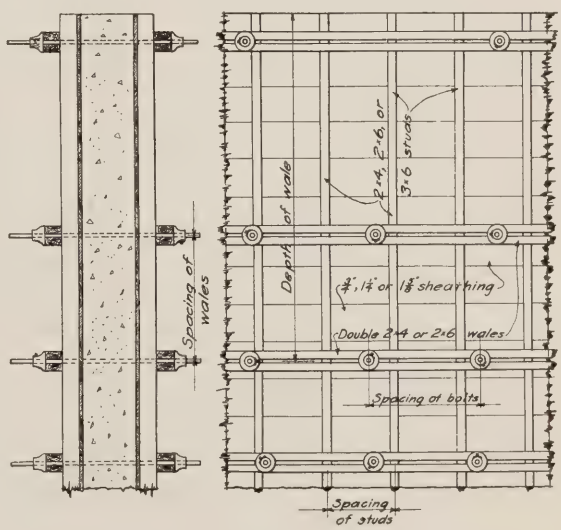


DIAGRAM OF WALL FORMS

For the second waler the waler spacing to be used is equal to the average of the spacings next above and below, or 47″, and the depth of waler is 4′ 5″ below the top of the concrete. Enter the diagram as before at the left-hand side at 47″ and follow horizontally to a depth of waler of 4′ 5″ (5/12 of the distance from the 4-foot curve to the 5-foot curve). Then follow vertically to the scale at the bottom, where it is found that the ⅝″ bolts should be spaced about 24½″ apart. Since the height of concrete to be poured is limited to 6 feet, the same bolt spacing can be used for all walers below the second.

Example: No. 2

Suppose that the wall in the preceding example is short and the concrete is to be placed at the rate of 12 feet in 45 minutes (16 feet per hour).

Thickness of Sheathing and Spacing of Studs: The pressure of the concrete at a depth of 12 feet will require studs to be spaced 10″ for the ¾″ sheathing, or 18″ for the 1¼″ sheathing. It should also be noticed that for 2x6″ studs the waler spacing at 12-foot depth is 24″ with 10″ stud spacing and 15″ with the 18″ stud spacing. In important cases two or more complete designs should be made and their cost estimated so that the most economical can be determined.

In the present example the ¾″ sheathing and 2x6″ studs spaced 10″ will be used.

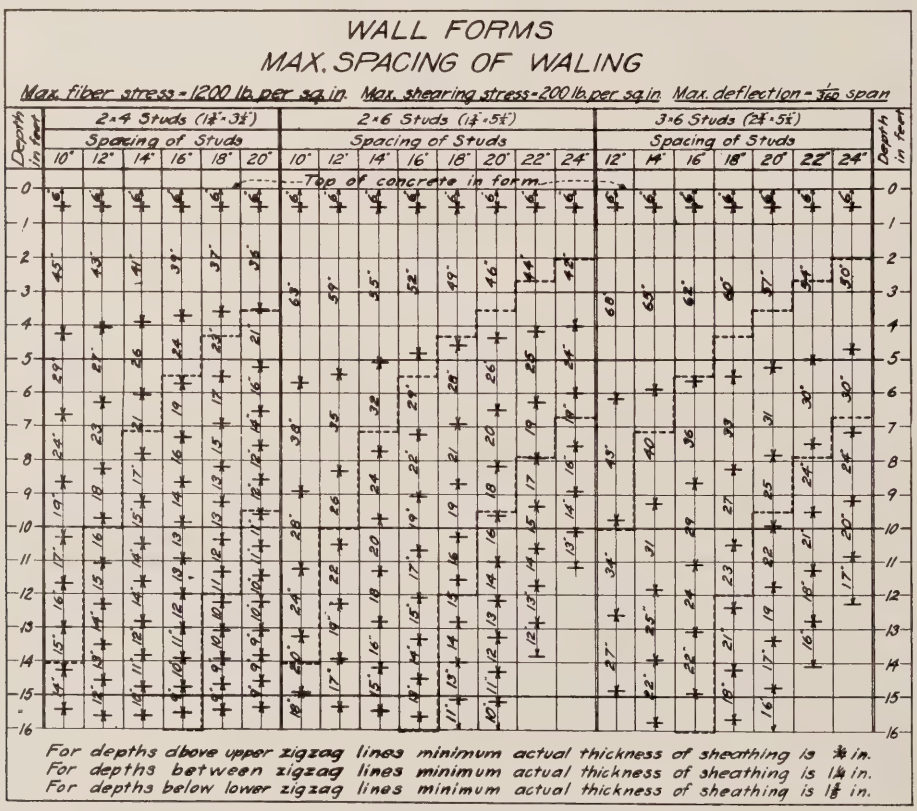
Spacing of Walers: For the 2x6″ studs spaced 10″ the table gives the spacing of walers as 6″, 63″, 38″, 28″, 24″.

Spacing of Bolts: Using double 2x6″ walers and ⅝″ bolts, the bolt spacing should be found as in the previous example. The values for the different walers are given in the following table:

No. of Waler—	1	2	3	4	5, 6, etc.
Waler Spacing	63″	50½″	33″	26″	Same as 4th
Depth	6″	5′ 9″	8′ 11″	11′ 3″	
Bolt Spacing (from diagram)	57″	17½″	17½″	17½″	

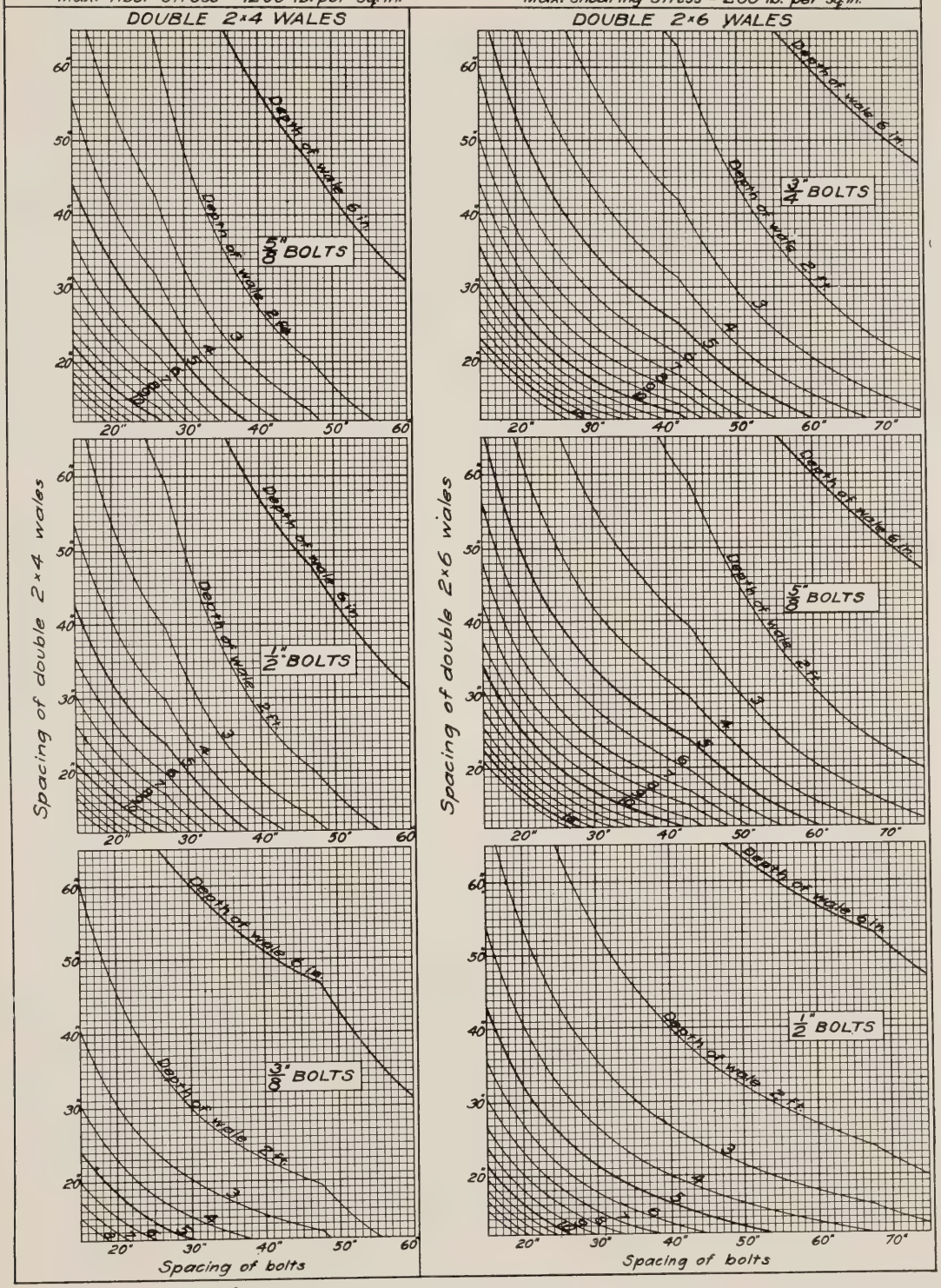
Below the fourth waler the spacing of walers can be 24″ down to the bottom.

The cut, on page 11, shows the various members of the form construction referred to above. All tables and diagrams shown in our catalogue should be of great value to the contractor, both in the estimating and constructing of a job.


WALL FORMS
MAX. SPACING OF WALING
Max. fiber stress - 1200 lb per sq in. Max. shearing stress - 200 lb per sq in. Max. deflection - 1/360 span
2×4 Studs (1¾″×3½″)
2×6 Studs (1¾″×5½″)
3×6 Studs (2¾″×5½″)
Spacing of Studs
10″ 12″ 14″ 16″ 18″ 20″ 22″ 24″
Depth in feet
Top of concrete in form
For depths above upper zigzag lines minimum actual thickness of sheathing is ¾ in.
For depths between zigzag lines minimum actual thickness of sheathing is 1¼ in.
For depths below lower zigzag lines minimum actual thickness of sheathing is 1⅝ in.

WALL FORMS
MAX. SPACING OF BOLTS

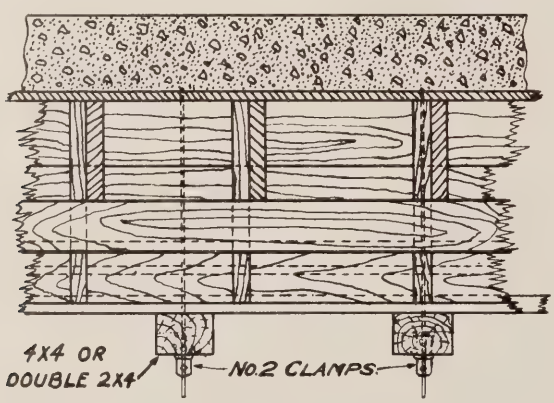
Max. tension in bolts = 16 000 lb. per sq. in. on gross section
Max. deflection of waling = 1/360 of span
Max. fiber stress = 1200 lb. per sq. in. Max. shearing stress = 200 lb. per sq. in.

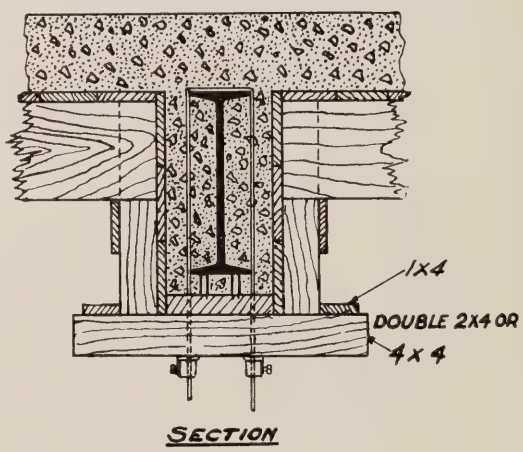


To avoid shoring, 3/8" rods and No. 2 Form Clamps were used on this freight house to carry exceptionally heavy loads.

Hanging Forms for Heavy Loads

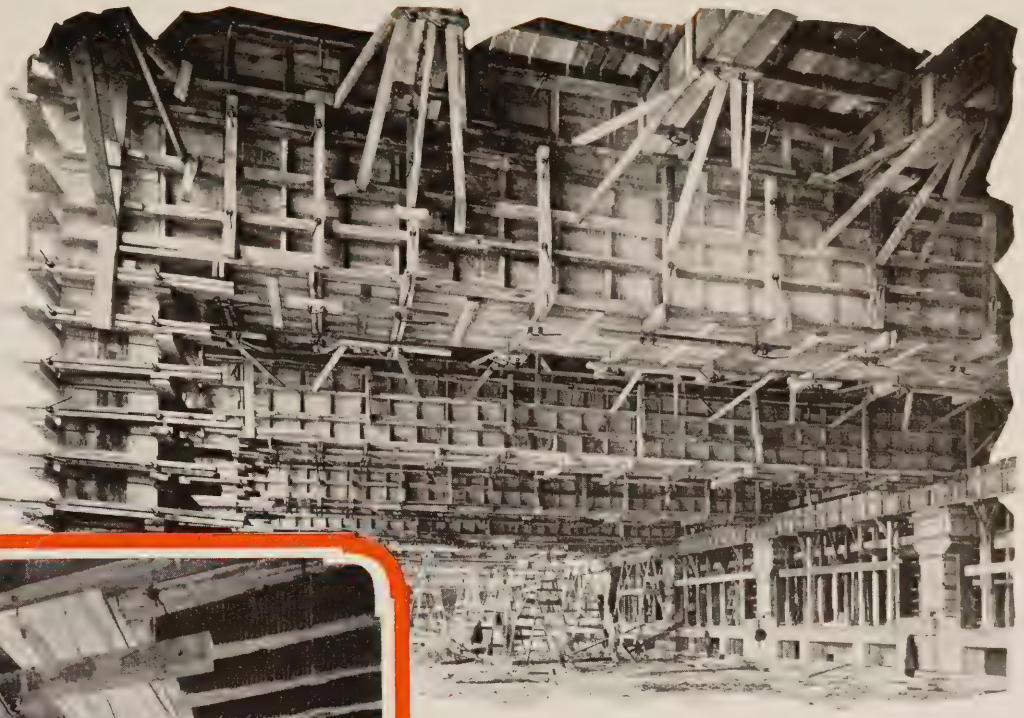
THERE are certain types of construction, such as railway overheads, fireproofed steel bridge construction, and industrial building of steel skeletons with heavy floor slabs, etc., which demand hangers for form work and greater capacity than is possible with the Universal Beam Clamp described on pages 24 to 29. The Universal Form Clamp solves this problem efficiently and economically. Using a U-shaped hanger as shown in the accompanying section and elevation, a 3/8" rod with two clamps will carry a maximum of 12,000 pounds; the 1/2" rod 18,000 lbs. and the 5/8" rod 24,000 lbs. It is not recommended that these loads be applied, since a factor of safety is necessary, but they do represent the possibilities of this method. This system itself is extremely simple as evidenced by the cuts and the sketch shown on these pages.

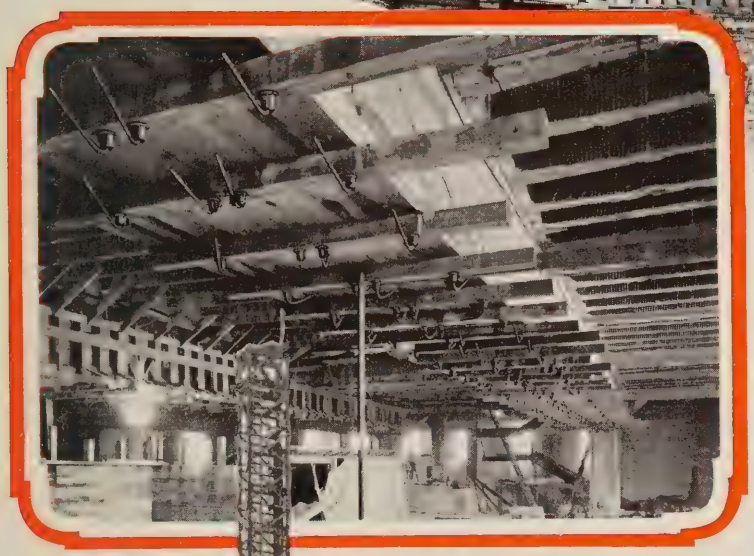




SECTION

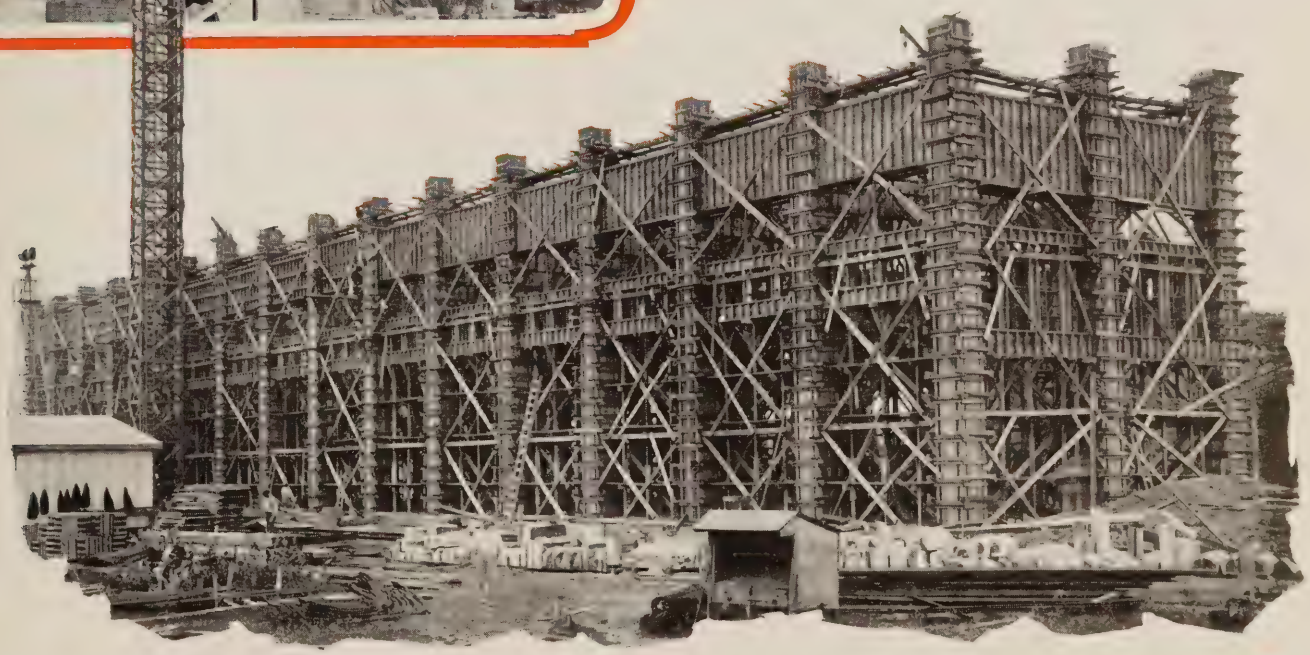
For this unusually heavy construction, forms were hung with Form Clamps on rods passed through holes in the stiffener angles of the girders.





The forms for this large double girder were hung with No. 2 Universal Form Clamps

This power plant is a good example of the type of heavy construction on which Universal Form Clamps are used to advantage for hanging forms and on all walls and columns.



Universal Form Clamps on Riser Forms

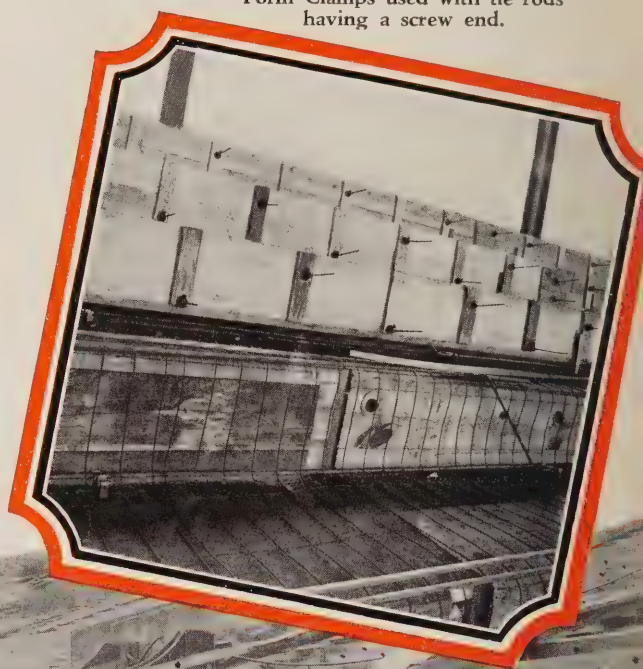
UNIVERSAL FORM CLAMPS afford a most economical means of tying riser forms in stadium, grandstand and theatre balcony construction. The two methods outlined are equally practical. Method A, illustrated below, eliminates all work underneath and behind the forms.

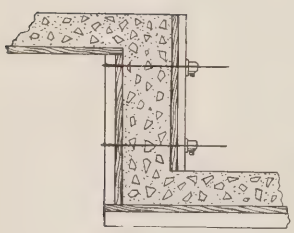
With the No. 1 Universal Form Clamp, a 5/16" rod with a 2½" wood screw on one end is furnished. This rod acts as a lag screw and goes through the front form and into the rear form of the riser. Holes for this rod should be drilled with electric equipment. A Universal Form Clamp is slipped over the outside end of the rod and the front form drawn into line with a Universal Tightener. One line of rods is sufficient for shallow risers. If the risers are deep, the rods should be staggered high and low to prevent tilting.

Rods may be removed with the same tool (brace or an electric drill) with which they were inserted, or by bending the rod at right angles outside the form, to make a handle with which to twist out the rod.

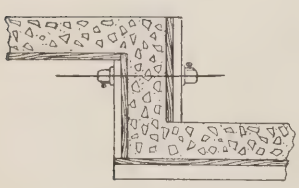
Method B, shown below, makes use of a plain ¼" or 5/16" rod and two No. 1 Universal Form Clamps. Holes are bored through the front and rear riser forms, and the rod with the clamp already fastened on one end inserted from the back. The clamp is then slipped over the front end of the rod and the form drawn into line as before. The rod is easily removed with a No. 1 Universal Rod Puller.

View of riser form before the front wall is in place. It will be quickly fastened by Universal Form Clamps used with tie rods having a screw end.



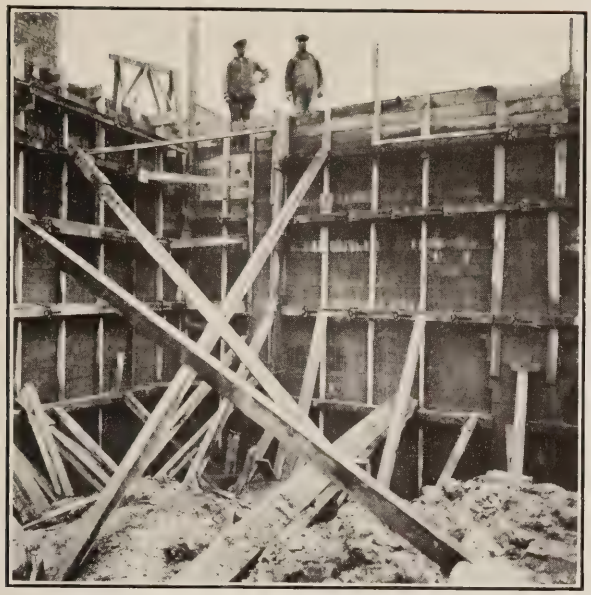


Method A



Method B

One row of Universal Form Clamps with special wood screw tie rods were sufficient for these shallow risers.



Universal Wire Clamps were used with 2x4 walers on this wall.

Universal Wire Clamps can also be used directly on the studding, as shown above.

Universal Wire Clamps

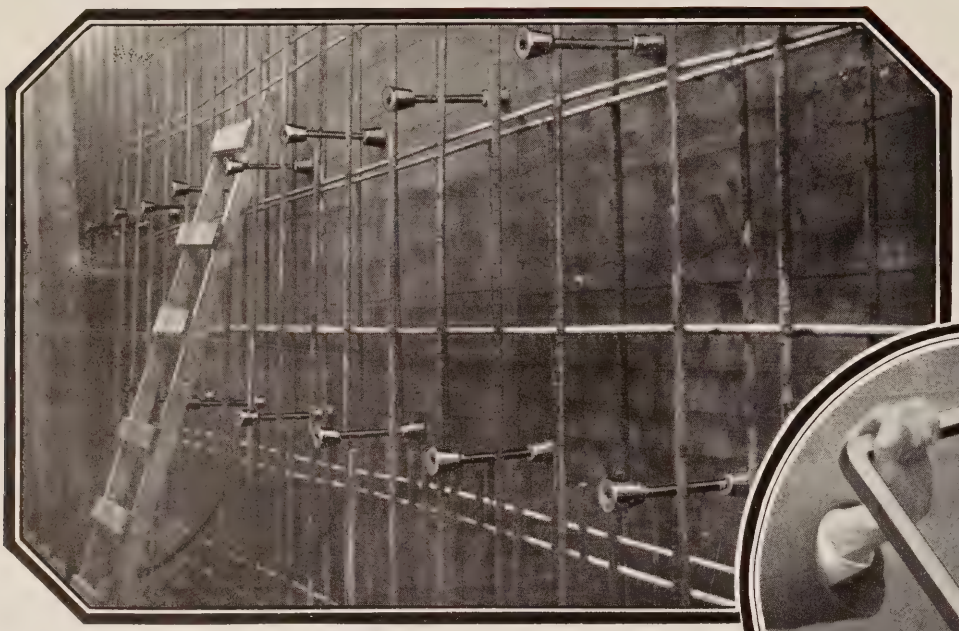
Patented March 27, 1917.

Position on form before clamping.

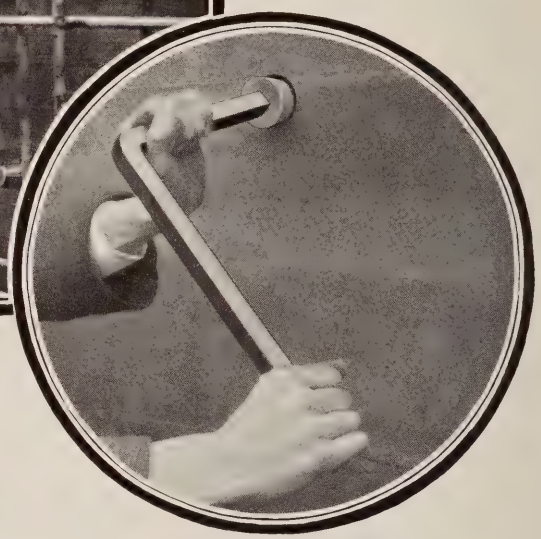
THESE cuts show the Universal Wire Clamp before and after clamping. It is a self-contained unit and, because it is self-locking, no loose parts are required to fasten it in place. The hinged base gives firm bearing against the studding or waler. As the clamp is snapped into place, it has a $1\frac{1}{2}$" draw on the wire. All of the tightening is done from the outside of the form. This is a particular advantage in narrow walls, as all twisting of wire is eliminated. Over-twisted wire may be stressed past its elastic limit, to break when a load is applied, yet its condition is not apparent from inspection. This cannot happen with Universal Wire Clamps. Sizes and weights are shown on page 22.

We furnish wire straightened and cut to length.

Position on form after clamping.



Universal Cone Nuts in position in wall of a large sewage disposal plant. The back form is erected, the stud rods run through the walers, and the center rod (which acts as a spreader) with cone nuts threaded onto the studs. The front form will be fastened in place by threading its stud rods into the front cone.



Cone nuts are quickly removed from the wall with this wrench, which fits into the square socket of the cone nut.

Universal Cone Nuts

Rod Couplings for Water-Tight Walls

Patented.

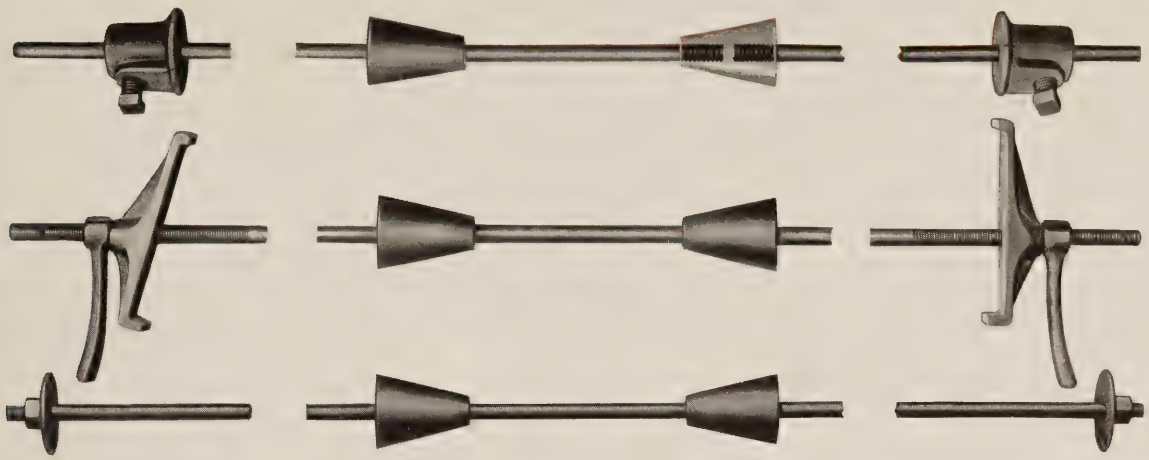
UNIVERSAL CONE NUTS space the forms and hold them rigid while the concrete is being poured. They are particularly adapted for tying forms on reservoir work, sewage disposal plants, etc., where a water-tight and acid-proof job is required. The specifications on this type of work provide against the exposed ends of rods in the wall.

Universal Cone Nuts are rod couplings, placed so that the large end of the cone is flush against the inside of the form walls. The tie rod, which also serves as a spacer or separator, is threaded into the small ends of the cone nuts, holding them firm against the inside walls of the form. A stud rod, threaded on one end, threads into the large end of the cone nut and passes through the wall form. A Universal Form Clamp is used on the outside end of this stud rod, thereby eliminating the thread on the outer end protruding through the forms.

The advantage of form clamps is immediately perceived, in that form lumber may vary in size on the same job, necessitating various lengths of stud rods threaded at both ends if nuts and washers are used. The form clamps make necessary only 1″ of thread on the inner end of the rod entering the cone nuts, allowing the outer end to project any distance desired beyond the forms and permitting a wide range of adjustment without variation of rods.

However, if the contractor desires, the stud or outside rods may be threaded on both ends, and nuts and washers used. Universal Malleable Washers are described on page 7. Or he may use the wing nuts and brackets as illustrated. These can also be obtained from this company. It is emphasized, however, that neither of these other two applications of the Cone Nut are as efficient and economical as with the Universal Form Clamp.

The large end of the Cone Nut is cast with a square socket to receive a wrench supplied with the nut, by which they are removed from the wall after the forms are stripped. The Cone Nuts should be removed as



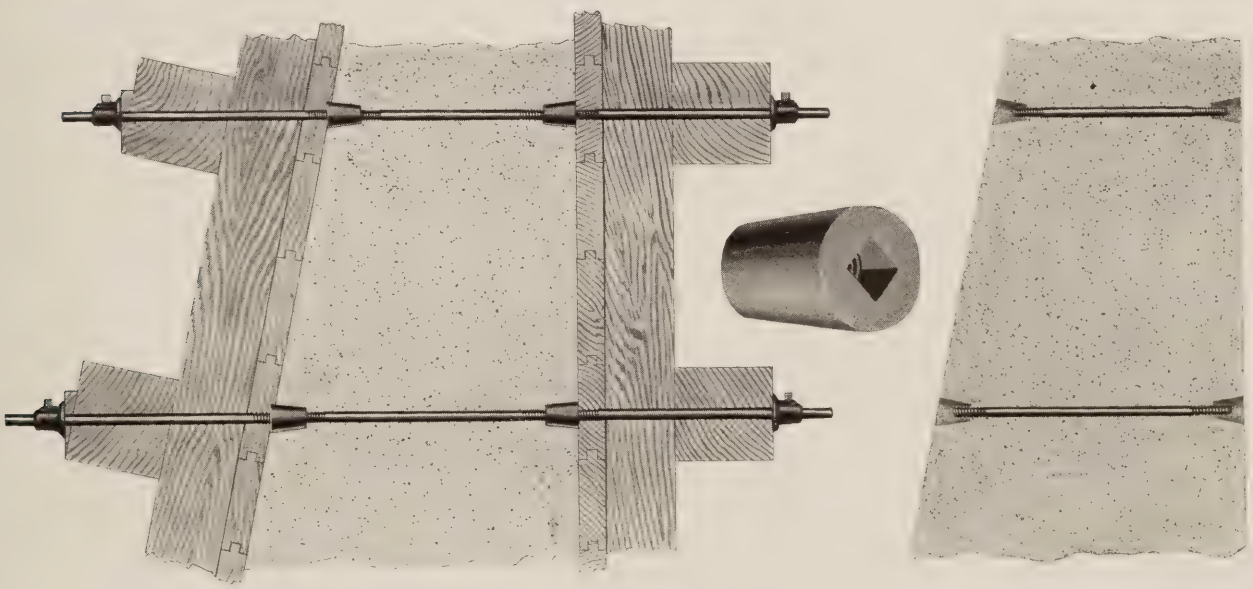
soon as possible after pouring. During hot weather they should surely be removed within 24 hours. If it is impossible to remove the cones as early as desired, they should be dipped in parafin or heavy grease before being used.

All Universal Cone Nuts are machined on the entire outside after being tapped. This insures perfect concentricity, smoothness, and therefore extreme ease in removing from the wall.

Concrete is easily grouted in the conical hole left by the nut, and is anchored by the threads of the projecting ends of the center rods. No steel is exposed. This system is approved by the leading sanitary and hydraulic engineers throughout the United States.

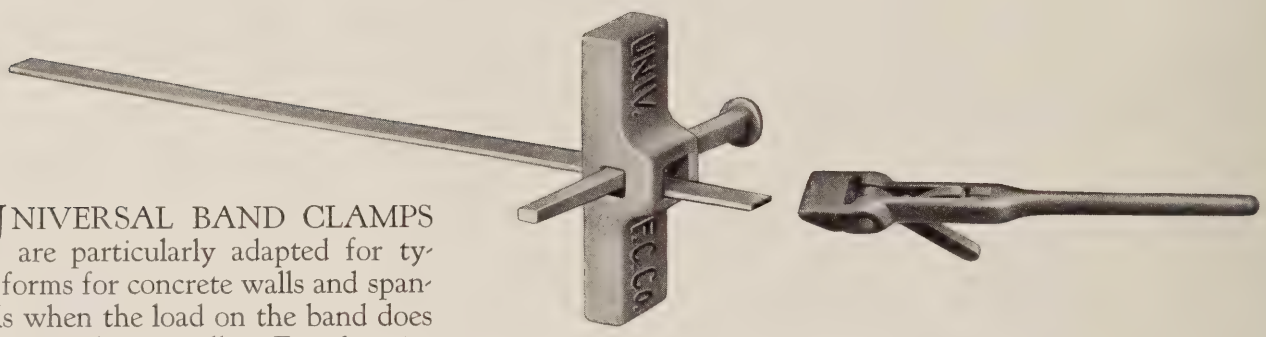
Costs by this method are reduced to a minimum. The Cone Nuts and the outside rods can be used again and again; only the tie rods remain in the wall.

Standard sizes and weights of Universal Cone Nuts are given on page 22. Center and outside rods properly threaded, are also furnished.



Universal Band Clamps

For Walls and Spandrels



UNIVERSAL BAND CLAMPS are particularly adapted for tying forms for concrete walls and spandrels when the load on the band does not exceed 1600 lbs. For heavier loads, use round rods with Universal Rod Clamps.

The Universal Band Clamp is a high grade malleable casting containing a slot through which is passed a band ½" by 14 gauge. This band is held in the clamp by means of a 30 penny standard cut nail driven through openings in the side of the clamp to engage the band against the shoulder in the clamp. Universal Band Clamps are symmetrical, and the nail can be inserted from either side. There is no top or bottom.

Universal Band Clamps, with nails, weigh 43 pounds per hundred.

The tightening tool shown above has a draw of over an inch and is used to pull the form into line. A spring keeps the cam in constant contact with the band when operating.

Band Iron

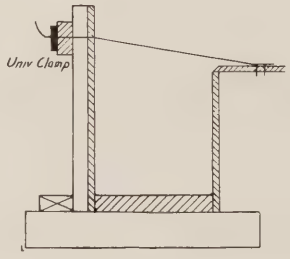
The Universal Band Clamp is used with ½" by 14 gauge band iron. The band this company furnishes contains an extra carbon content that adds considerably to the tensile strength above that of commercial stock. Because it is obtained in carload lots, it is sold for no more than ordinary hoop steel. A series of tests made by the Robt. W. Hunt Co. gives the following as average for this special band:

Yield Point	Maximum Load
2050 pounds	3000 pounds

The Universal Band Clamp will hold the maximum load without permitting the band to slip. This band iron is furnished in coils of about 80 lbs. each, or can be obtained cut to length. One thousand lineal feet weighs 145 lbs.

For Spandrel Beams

Universal Band Clamps used on spandrels eliminate the use of braces and cumbersome L-Heads for tying beam sides. A double 2x4 waler is run along the top of the outer side of the spandrel; the band clamp bears on this waler the other end of the band being nailed to the decking. This company furnishes band iron cut to length with two nail holes punched in one end. If the work is on structural steel, the Universal Beam Clamp should be used.



A section showing the Band Clamp used for Spandrel Beams.

Double 2″x4″ walers were used with built-up removeable sections on this wall.

Wall Forms

The cuts show the simplicity of form design possible with this clamp. Double 2x4 walers are most practical, no boring of holes being necessary. If built-up removable panels are used, a chisel driven in the crack between two boards will give room for the band. If forms are built in place, the bands with the clamp fastened to one end are placed between the boards at the required intervals.

UNIVERSAL HEXAGONAL ROD COUPLINGS find a wide use in form work when it is not required to salvage these castings for re-use. They are applied in an identical manner, and for the same purpose as Universal Cone Nuts, with the exception that hexagonal couplings are located about 1″ or more inside the wall form. When the outer stud rod is removed and the hole that it has left is filled with neat cement, a clean, unblemished wall remains with no exposed metal.

Universal Hexagonal Couplings are designed to develop the full strength of the rod and meet the requirements of the Government for continuous reinforcement. They are, therefore, much used for butt joining of reinforcing steel in heavy work. Standard sizes and weights are shown on page 22.

Sizes of Universal Form Clamps

Clamp	Size of Rod	Base Diam.	Length	Wt. Per 100
No. 1	1/4"	2 "	1 3/8"	60 lbs.
" 2	3/8"	2 3/8"	1 7/8"	107 "
" 3	1/2"	2 1/2"	2 "	126 "
" 4A	5/8"	3 "	2 "	235 "
" 4X	5/8"	3 1/4"	2 3/4"	267 "
" 5	3/4"	4 5/8"	3 1/2"	520 "

Carrying Capacity of Form Clamps and Rods

The table below is based on the Screw of the Clamp being properly set. When it is so adjusted, Nos. 1, 2, and 3 clamps will hold past the rupturing point, Nos. 4, 4x and 5, past the elastic limit of the rods, by actual test. It is taken that mild steel rods are used, with a tensile strength figured at 16,000 pounds per square inch. The bearing strength is based on 400 pounds to the square inch and applies to the wooden member against which the clamp rests.

Clamp	Size of Rod	Area of Base	Bearing Capacity	Rod Capacity
No. 1	1/4"	3.07 sq. in.	1200 lbs.	785 lbs.
" 2	3/8"	4.43 " "	1772 "	1765 "
" 3	1/2"	4.66 " "	1865 "	3150 "
" 4	5/8"	6.70 " "	2680 "	4850
" 4x	5/8"	7.93 " "	3170 "	4850 "
" 5	3/4"	16.20 " "	6480 "	7050 "

Universal Wire Clamps

Clamp	Wire	Width	Wt. Per 100
No. 1 Wire Clamp	No. 8, 9 or 10 Wire	2 1/4"	135 lbs.
" 2 " "	" " " " "	4 1/4"	150 "

Universal Cone Nuts (Couplings)

Nut	Size of Rod	Base Diam.	Length	Wt. Per 100
No. 2	3/8"	1 9/16"	2 1/8"	45 lbs.
" 3	1/2"	2 "	2 5/8"	108 "
" 4	5/8"	2 "	2 5/8"	112 "
" 5	3/4"	2 13/16"	3 3/8"	235 "
" 6	7/8"	2 5/8"	3 1/2"	280 "

Universal Rod Couplings (Hexagonal)

Coupling	Size of Rod	Diam. (flat)	Length	Wt. Per 100
No. 3	1/2"	1 "	1 1/2"	30 lbs.
" 4	5/8"	1 1/8"	1 11/16"	40 "
" 5	3/4"	1 3/8"	1 15/16"	65 "
" 6	7/8"	1 5/8"	2 5/16"	115 "
" 7	1"	1 7/8"	2 11/16"	170 "

Universal Beam Clamps

Size of Clamp	Shape of Hook	Take Flange	Weight per 1000
Standard	Round	3/4" Std. Sect.	190 lbs
1"	Square	1" Car. or Beth.	190 "
1 1/4"	Square	1 1/4" Car. or Beth.	320 "
1 1/2"	Square	1 1/2" Car. or Beth.	320 "
1 3/4"	Square	1 3/4" Car. or Beth	320 "

Sizes of Tightening Wrenches

No. 1. To be used with No. 1 Clamps. Weight, 4 lbs.
No. 2. To be used with No. 2 Clamps. Weight, 4 lbs.
No. 3. To be used with No. 3 Clamps. Weight, 4½ lbs.
No. 4. To be used with No. 4 Clamps. Weight, 5½ lbs.
No. 5. To be used with No. 5 Clamps. Weight, 5½ lbs.

Part List

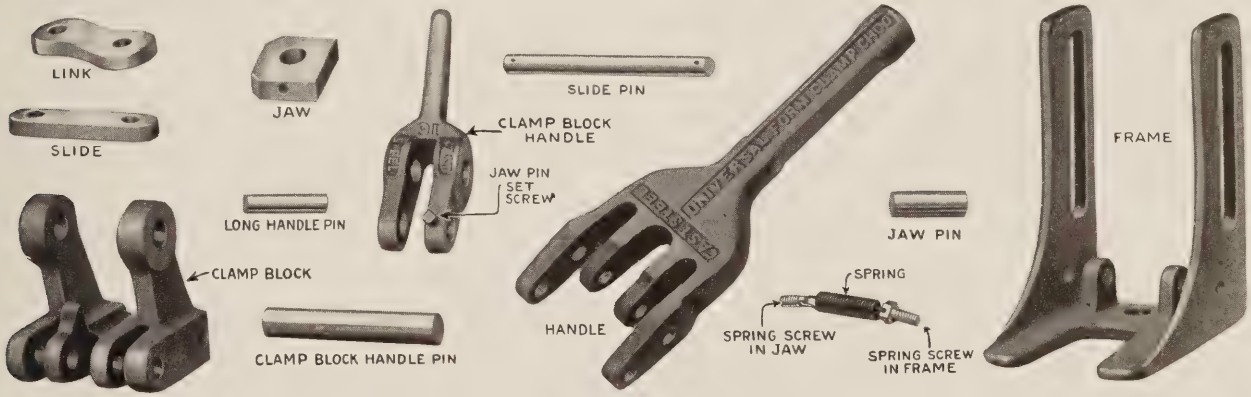
	Number of Tightener and Rod Sizes				
	No. 1—¼" Rod	No. 2—⅜" Rod	No. 3—½"	No. 4—⅝" Rod	No. 5—¾" Rod
Name of Part	Part No.	Part No.	Part No.	Part No.	Part No.
Screw	101	102	200	300	400
Nut	103	103	201	401	401
Handle	104	104	104	104	104
Cam	105	105	105	105	105
Handle Pin	106	106	106	106	106
Cam Pin	107	107	107	107	107

(IMPORTANT: Order all repair parts for tighteners and pullers by number.)

Rod Pullers

No. 1. For pulling ¼", 5/16, ⅜" and ½" rods not longer than 4'. Weight, 23 lbs.
No. 2. For heavy work. Takes rods from ¼" to ¾". Weight, 32 lbs.

Jaw for only one size of rod furnished. State size of jaw or rod on which puller is to be used, when ordering.

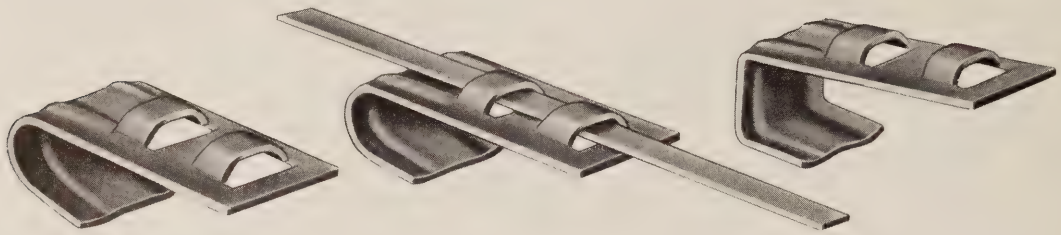


Part List

	No. 1 Puller	No. 2 Puller		No. 1 Puller	No. 2 Puller
Name of Part	Part No.	Part No.	Name of Part	Part No.	Part No.
Handle	P21	P1	Jaw Pin	P30	P10
Short Handle Pin	P22	P2	Clamp Block Handle Pin	P31	P11
Long Handle Pin	P23	P3	Clamp Block Handle	P32	P12
Link	P24	P4	Spring Screw in Jaw	P33	P13
Slide Pin	P25	P5	Spring	P34	P14
Slide	P26	P6	Spring Screw in Frame	P35	P15
Clamp Block	P27	P7	Slide Cap Screw	P36	P16
Frame	P28	P8	Jaw Pin Set Screw		P17
*Jaw	P29	P9	Cotter Pins	P38	P18

***When ordering Jaws state size of rod being used as well as part number.**

Hanging Forms from Structural Steel

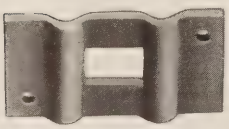


Universal Beam Clamps for rounding and square beam flanges.
Patented November 27, 1928.
Patent Numbers 1,693,239-40-41

THESE pages show a new and efficient method of hanging forms which greatly reduce labor costs as well as the quantity of lumber and nails required for framing. In actual construction, five floors were hung by this system at a greatly reduced cost with the lumber alloted for four floors. This saving was accomplished by means of Universal Beam Clamps and Universal Metal Cleats.

The Beam Clamp is a stamping made of 1¾″ by 12 gauge steel. It is designed to hook over the top flange of steel beams and girders and to hold the bands suspending the forms. This Clamp is made in five sizes for standard I beams, Carnegie and Bethlehem sections up to flanges 1¾″ thick. The band iron is slipped under the two raised lugs on the Beam Clamp, as shown in the illustrations. To hold this band, these lugs are hammered down, giving a double grip which will hold the full strength of the band. Two Beam Clamps are used per hanger.

There are several methods of framing with this clamp and band.



The washer used with wooden cleats.

1st. By boring holes in 2 by 4 or 4 by 4 wooden cleats and passing the band through these holes. Special washers are furnished to go over these holes or over a double 2 by 4 cleat, to provide bearing for the band. This washer is necessary to prevent deflection caused by the band cutting into the wood.

2nd. The band may be placed diagonally under a wooden cleat. Because the band cuts into the sides of the cleat, this method is sure to cause a certain amount of deflection.

3rd. By using Universal Metal Cleats, all wooden cleats and their accompanying deflections and high costs are eliminated.

This Cleat, shown in the illustrations, is 30 inches long, made of two 1¼ by ⅛ inch angles riveted together in such a manner that the one-half inch band iron used for hanging passes readily between them. Nail holes are punched in the upper flanges for nailing to the beam bottom or soffit plank. The vertical flanges are punched one inch on center, in which holes the castings which support the band are held in place with cotter pins. It is by moving these castings along the slot between the angles that various widths of beam bottoms are taken care of. Since the band iron is placed outside the edges of the beam bottom, all boring of holes is avoided. In addition a "kicker plate" casting containing a fastening wedge is placed in each end of the assembly, sliding in the slot between the angles. These "kicker plates" hold the bottom of the beam sides in position. There are no loose parts to handle. The simplicity of the assembly is apparent from the cuts.

In framing with Universal Beam Clamps and Cleats, the following procedure is efficient. The Cleats are nailed to the beam bottoms at the required intervals, previously determined from the load to be carried. The band iron, cut to length,

Universal Metal Cleats, Beam Clamps and Band for hanging forms.

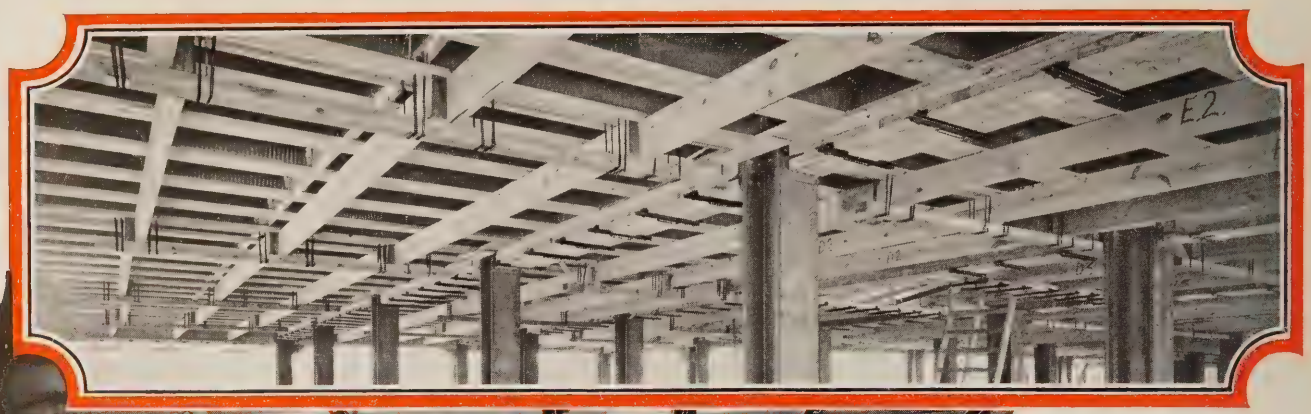
Patents Pending

is then placed in the Cleat under the "kicker plates" and over the band castings. The beam bottom is then turned over, the soffit spacers put on and the Beam Cleats slipped over the ends of the band iron. The beam bottom is then ready to raise. All tightening and securing of the beam bottom on the steel beam is done from the top of the beam, no scaffolding being necessary. The beam bottom is drawn up tightly against the beam flange with the Universal Band Tightener. When the beam bottom is in position, the band is secured by hammering down the lugs on the Beam Clamp.

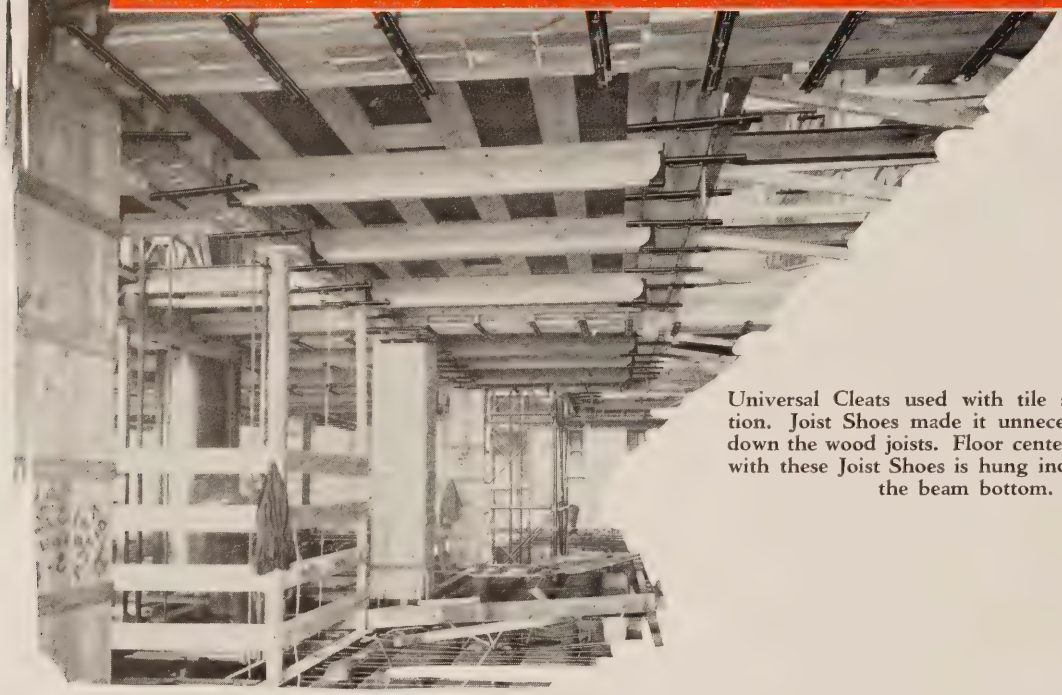
The savings by this method are apparent. All cutting, nailing and boring of wooden cleats is eliminated, as well as the boring of holes in the beam bottoms. If beam side cleats are spaced on the same centers as the hangers, kicker strips are also unnecessary. All work is done from the top of the floor being hung. The method is as practical for tile soffits as for concrete. A sample, gladly sent, will be a revelation.

Universal Joist Shoe.

In certain designs, especially where Carnegie or Bethlehem beam sections are used, the bottom of the wooden joists of the centering for the slab will fall below the Cleats. Either of two methods will easily allow these joists to be hung from the steel beam. One, by using a wooden block between the Cleat and the beam bottom; the other, by using the Universal Joist Shoe as illustrated. When these Shoes are used, the joists for the floor slab are hung independently of the beam bottom. This casting is designed to receive a



Three shores will be placed under each wood joist when this floor is poured, or one shore for every 50 square feet of floor area. Eight floors of this building were framed before pouring began.



Universal Cleats used with tile soffit construction. Joist Shoes made it unnecessary to block down the wood joists. Floor centering supported with these Joist Shoes is hung independently of the beam bottom.

two inch joist of any depth, and is suspended from the steel beam by a double band through two slots in the back of the casting, and two Beam Clamps.

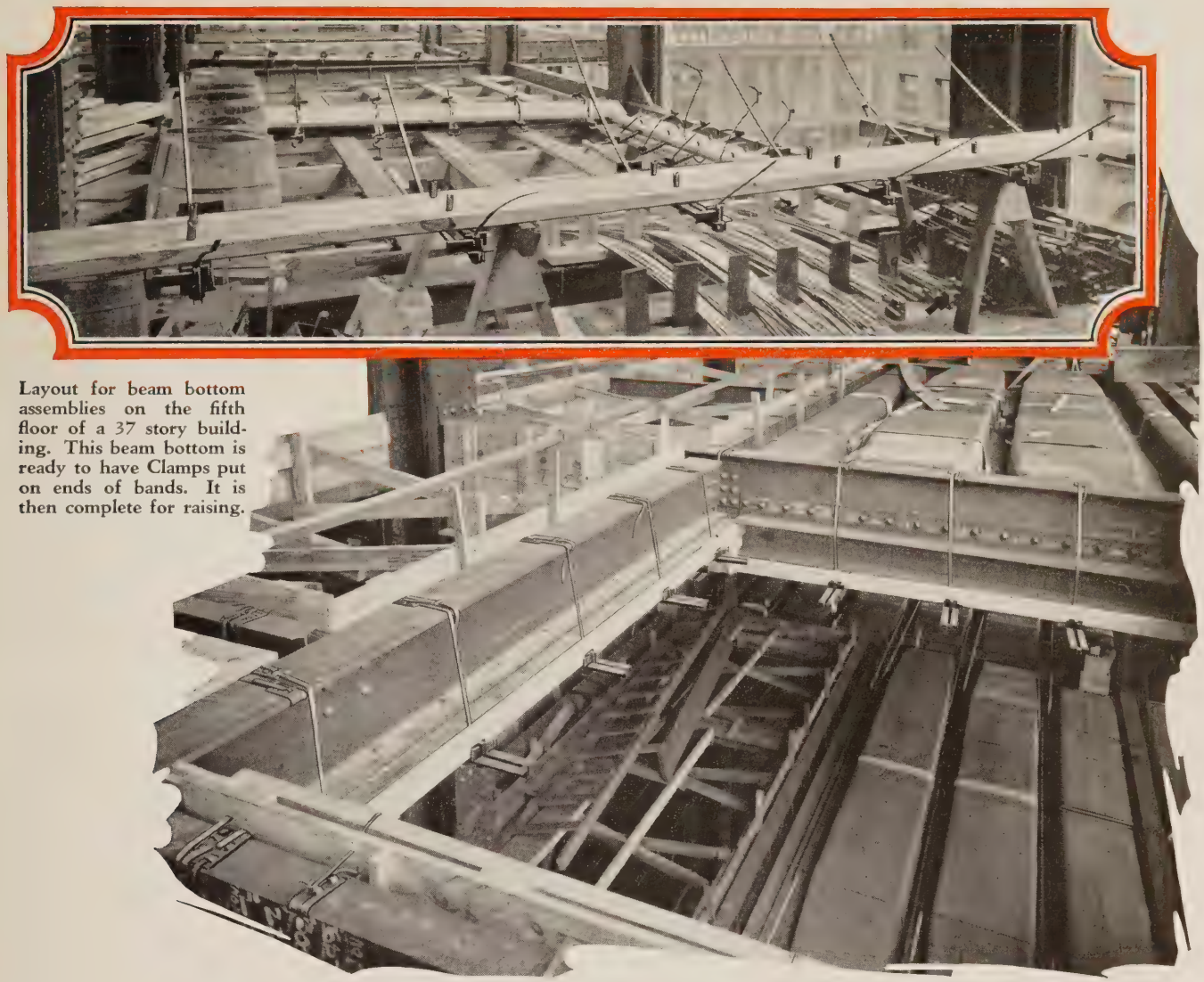
Attention is called to the ease of wrecking with Universal Cleats. There is more than a half inch of clearance between the band and the lower edge of the Cleat, allowing easy access to the band with any type of cutter. The design of the Joist Shoe gives a similar clearance.

Band Irons and Safe Loads

Universal Beam Clamps are used with ½″ by 14 gauge hoop steel. The band furnished by this Company is of extra carbon content that adds considerably to the tensile strength above that of commercial stock. Because it is obtained in carload lots from the mill, it is sold for no more than ordinary hoop. A series of tests made by the Robt. W. Hunt Co. gives the following as average for this special band:

Yield Point	Maximum Load
2050 pounds	3000 pounds

Universal Beam Clamps will hold the full strength of the band. In considering the strength of a complete hanger, it should be treated as two bands, and the permissible single band load doubled.



Layout for beam bottom assemblies on the fifth floor of a 37 story building. This beam bottom is ready to have Clamps put on ends of bands. It is then complete for raising.

Universal Cleats and Beam Clamps at open well. Note the "kicker plates," how flat the Clamps lie on top of the beams, and also how Beam Clamps are used for tying spandrel sides. Universal Band Clamps can be used instead of wire.

If the building is of a considerable size, it is advantageous to set up a reel and a bench with a hand shear on it for cutting band iron. This band iron comes in coils averaging 80 pounds each. One thousand lineal feet weighs 145 pounds.

Universal Cleats are Rented

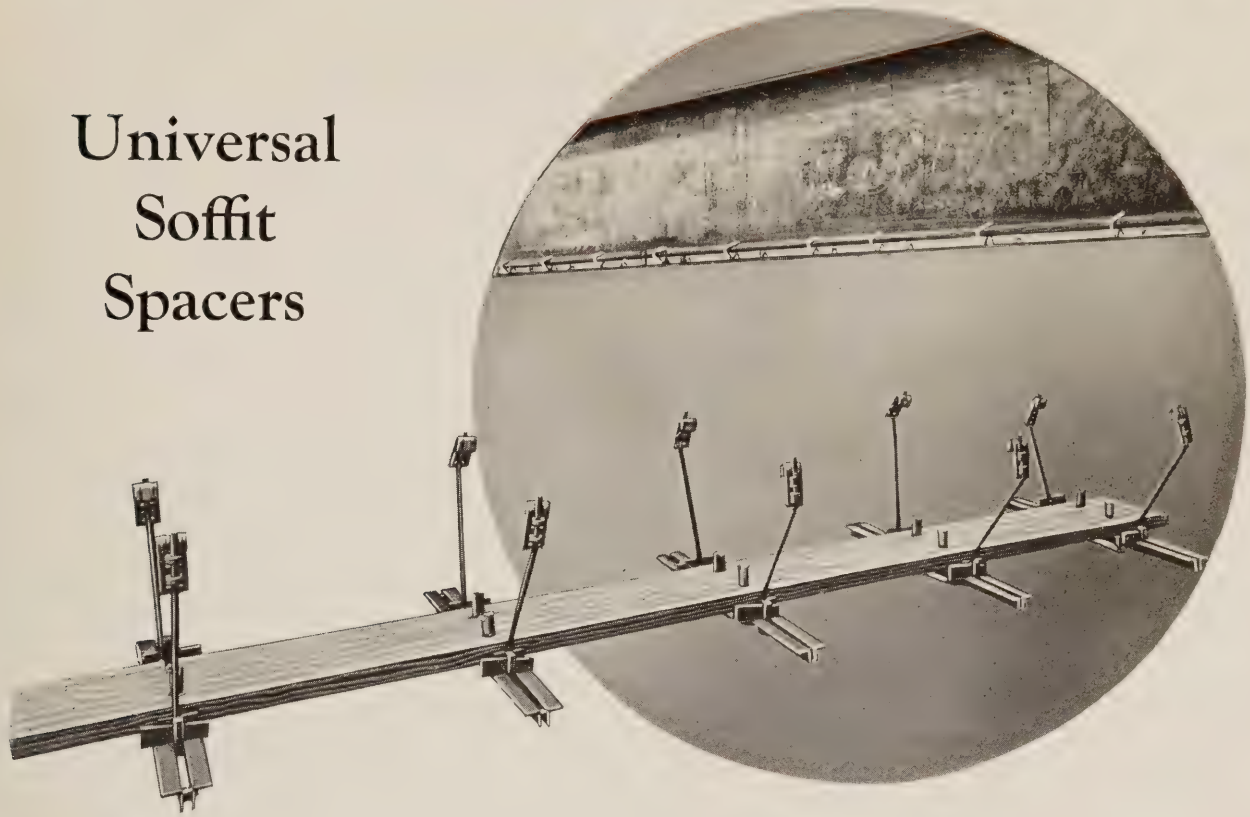
Universal Cleats are rented to the Contractor at a cost comparing favorably with cost of the lumber required for wood cleats. This rental will apply on the low purchase price, if the contractor wishes to buy after two or three months trial. These Cleats weigh less than eight pounds each, making the freight charges negligible. Universal Joist Shoes are also rented. They weigh one and three-quarters pounds each.

Universal Beam Clamps are very reasonably priced. Sizes and weights are shown on page 22.

Top illustration—A 4" by 6" was suspended from the tie beams with Universal Beam Clamps to carry the wood joists which supported the concrete joist bottoms.

Bottom illustration—Universal Beam Clamps with wood cleats and Special Universal Washers hung all forms on this large eight story building.

Universal Soffit Spacers

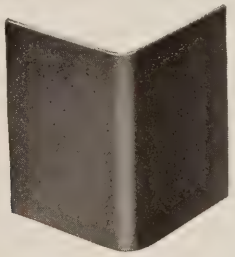


MILLIONS of the above Soffit Spacers or Separators have already been used on the largest buildings throughout the United States for separating and holding the soffit board away from the "I" beam or steel girder to insure concrete fireproofing below the beam. They are very inexpensive and pay their cost many times in the convenience and time savings they bring.

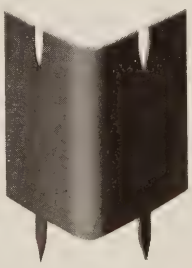
The Soffit Spacer is absolutely essential in work where the beam bottoms are suspended from the structural frame. It takes only an instant to place them at the desired intervals on the soffit board and the soffit can then be drawn up as tight as desired without changing the depth of fireproofing. It is also of decided advantage where the beam bottom is shored from below, as no matter what pressure is put on it, the correct depth of fireproofing is insured.

Soffit Spacers are used to equal advantage on fireproofed steel columns, and for spreaders for narrow wall forms.

The Type SB and Type SC Spacers, as shown below, have points which hold them firmly in the soffit board. The difference in these spacers is only a matter of width of the metal. The Type SB Spacer is made of 4″ stock; the Type SC of 2″ stock. They are made in any height.

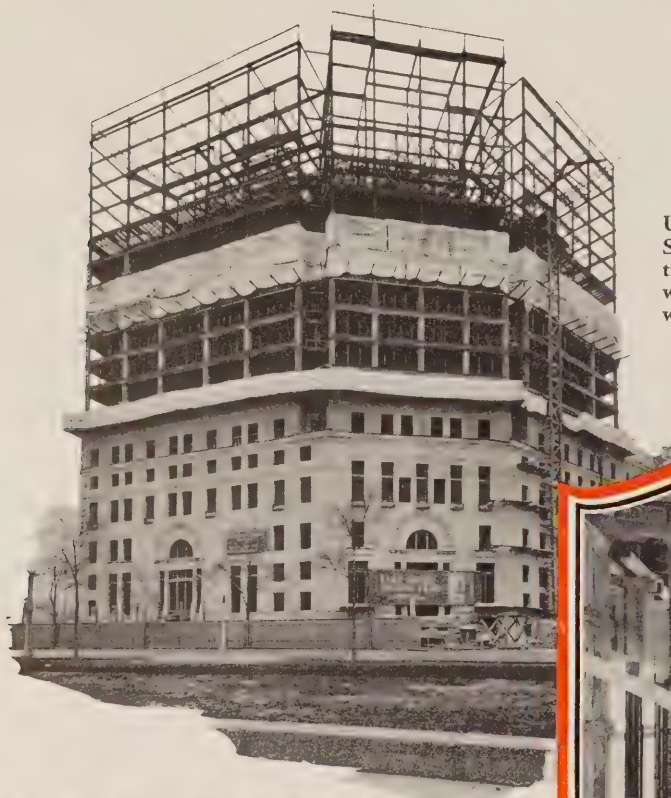


SA

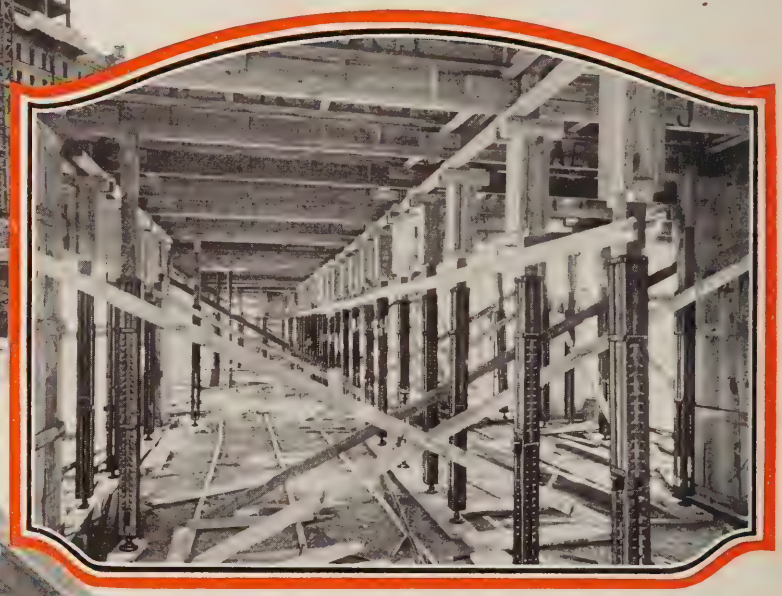


SB

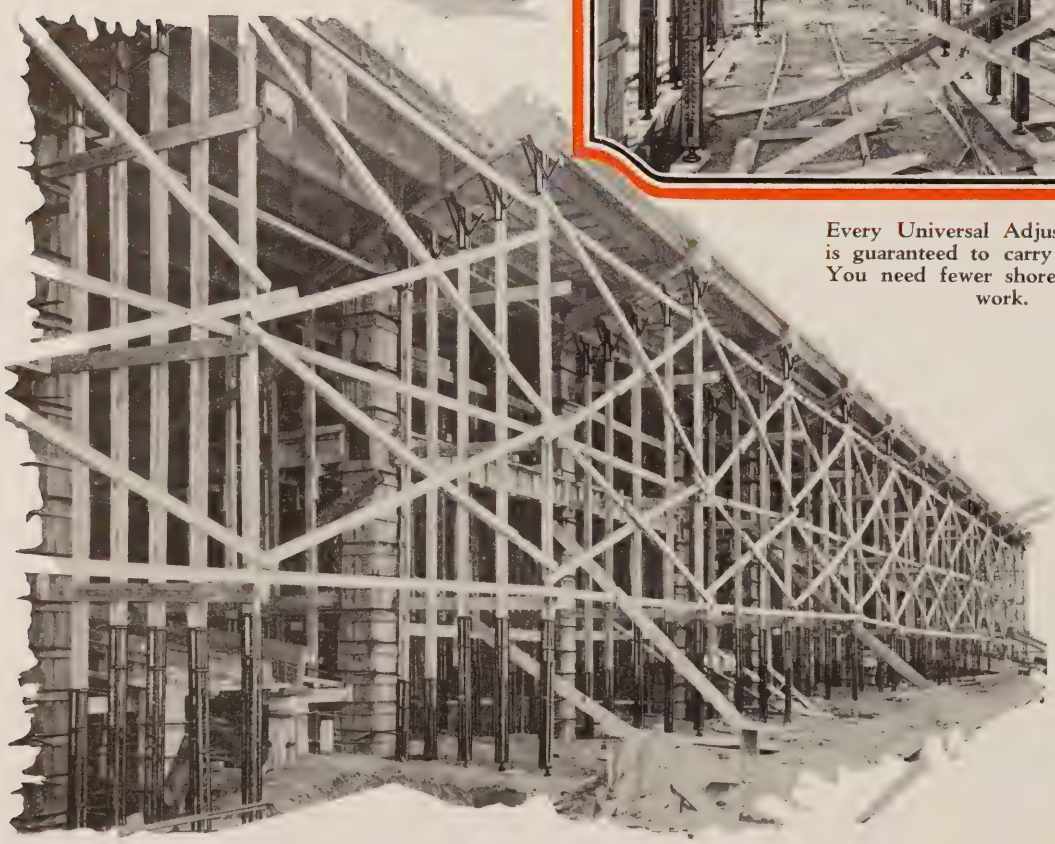
SC



Universal Adjustable Shores eliminated cutting, splicing and wedging in the shoring work on this building.



Every Universal Adjustable Shore is guaranteed to carry 12,000 lbs. You need fewer shores to do the work.



Instantly adjustable to the varying heights of these rising tiers, Universal Shores effected big savings in the erection of this stadium.

Universal Adjustable Shores

Patented April 1, 1919; Oct. 28, 1924; June 16, 1925; March 27, 1927. Others pending.

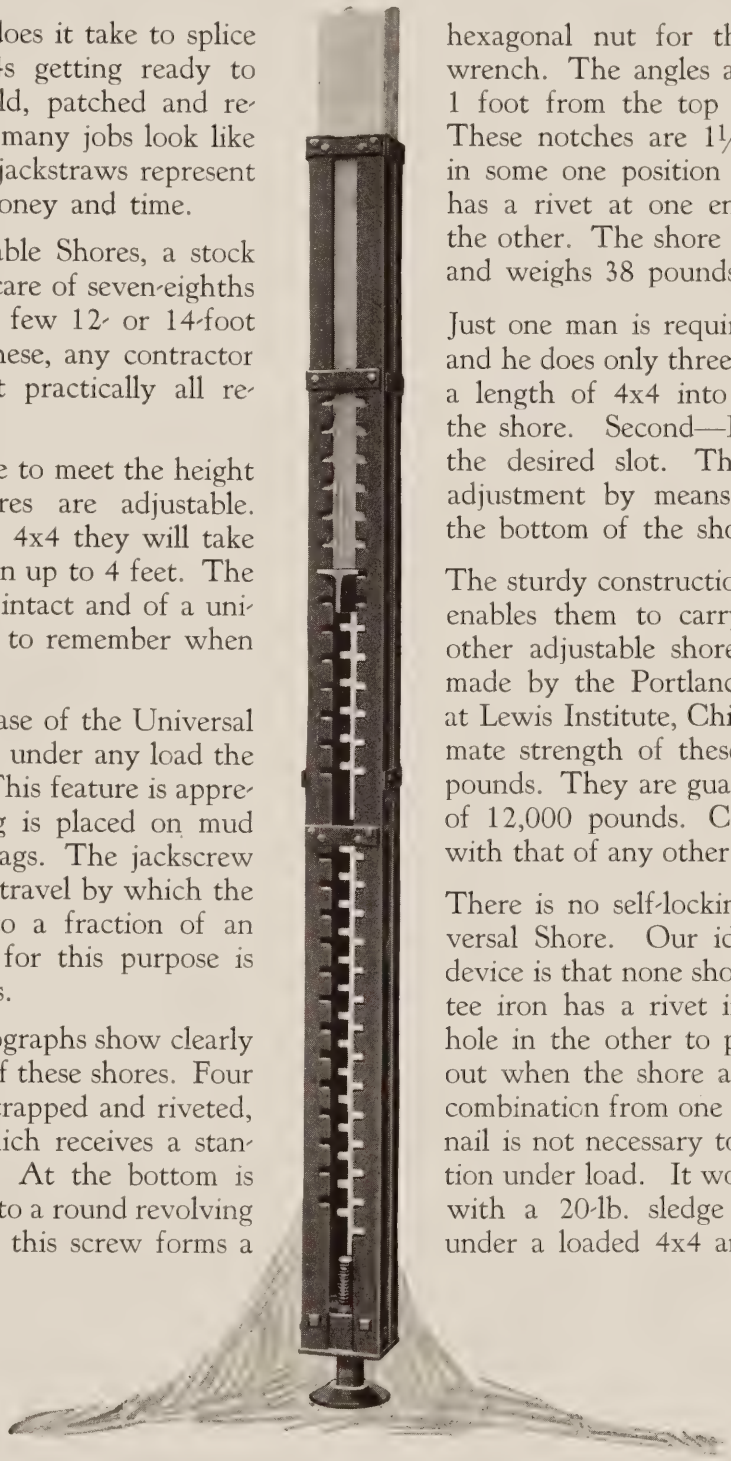
HOW much money does it take to splice and scab old 4x4s getting ready to shore each job? The old, patched and reworked 4x4s that make many jobs look like a forest of second-hand jackstraws represent a considerable loss in money and time.

With Universal Adjustable Shores, a stock of 8-foot 4x4s will take care of seven-eighths of the shoring. With a few 12- or 14-foot lengths in addition to these, any contractor is equipped to shore at practically all required heights.

It isn't necessary to splice to meet the height—these Universal Shores are adjustable. With any one length of 4x4 they will take care of all height variation up to 4 feet. The 4x4s are kept clean and intact and of a uniform size—a good point to remember when buying new lumber.

With the screw at the base of the Universal Shore, it can be adjusted under any load the same as any jackscrew. This feature is appreciated when the shoring is placed on mud sills or if the centering sags. The jackscrew at the bottom has 3″ of travel by which the shore can be adjusted to a fraction of an inch. An end wrench for this purpose is supplied with the shores.

The accompanying photographs show clearly the simplicity of design of these shores. Four steel angles 1½″x⅛″, strapped and riveted, form the metal cage which receives a standard dressed 4x4 post. At the bottom is the 1¼″ jackscrew set into a round revolving base. The lower part of this screw forms a hexagonal nut for the application of the wrench. The angles are notched, beginning 1 foot from the top down to the bottom. These notches are 1½″ apart and contain in some one position a standard tee which has a rivet at one end and a nail hole in the other. The shore is 5 feet 6 inches high and weighs 38 pounds.



Just one man is required to erect this shore and he does only three things. First—Drops a length of 4x4 into the steel member of the shore. Second—Inserts the tee iron in the desired slot. Third—Makes the final adjustment by means of the jackscrew at the bottom of the shore.

The sturdy construction of Universal Shores enables them to carry far more than any other adjustable shore. The series of tests made by the Portland Cement Association at Lewis Institute, Chicago, showed the ultimate strength of these shores to be 20,000 pounds. They are guaranteed for a safe load of 12,000 pounds. Compare this safe load with that of any other shore.

There is no self-locking device on the Universal Shore. Our idea of such a locking device is that none should be necessary. The tee iron has a rivet in one end and a nail hole in the other to prevent it from falling out when the shore and post are moved in combination from one place to another. This nail is not necessary to keep the tee in position under load. It would take several blows with a 20-lb. sledge to dislodge this tee under a loaded 4x4 and then only one side

could be dislodged. The screw can be turned only with the wrench.

The absence of self-locking devices permits easy and accurate reshoring with Universal Adjustable Shores. Self-locking devices must settle before they grip, whereas the adjustable screw in the base of the Universal raises the shore to meet the load.

Universal Adjustable Shores are of metal. There are no wooden parts to weather, work loose and become broken. These shores need only a little oil on the screw and an occasional coat of creosote paint, and with no other care whatever will last fifteen years under continual use. This is a very conservative estimate.

These Universal Shores will use stocks of old 4x4s. Every contractor has a yard full of random length 4x4s which he is continually splicing and sawing for reshoring. Practically every one of these posts can be used without the cost of this carpentering with Universal Shores.

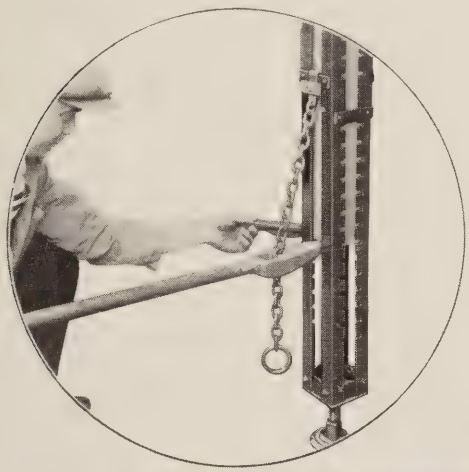
Here are just a few of the things that the use of Universal Shores will save. When new 4x4s are bought for shoring, they must be cut to length or at least squared off. If old 4x4s are used, they have to be spliced or again cut to length. Wedges have to be cut, two for each post, pounded in and nailed. If the elevation is changed, these nails have to be pulled and the wedges have to be pounded and nailed again. All this is done with a few turns of the jackscrew on the Universal Shore. The time needed for squaring ends, splicing 4x4s, making wedges and erecting with them, comes to a large figure on the cost sheet, a figure that can be eliminated with Universal Shores.

A few turns of the jackscrew on the Universal Shore releases the load gently. There is no danger of cracks appearing in the ceiling. The shore and post can be moved without changing the height to a similar story or another part of the same floor, or readjusted for another height.

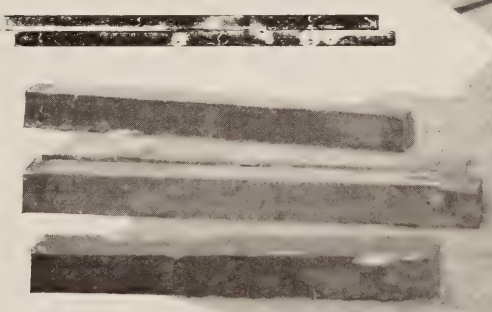
Simply drop a 4x4 into the Universal Shore and insert the tee iron at the desired height. Final adjustment is made with the jackscrew at the base of the shore.

It is occasionally necessary to raise the 4x4 inside the shore after it has been erected. This occurs when the tee iron has been placed in the wrong notch and the distance to be gained or lost is more than the 3″ of travel in the jackscrew. For this purpose the lifting tool shown below is furnished with the shores.

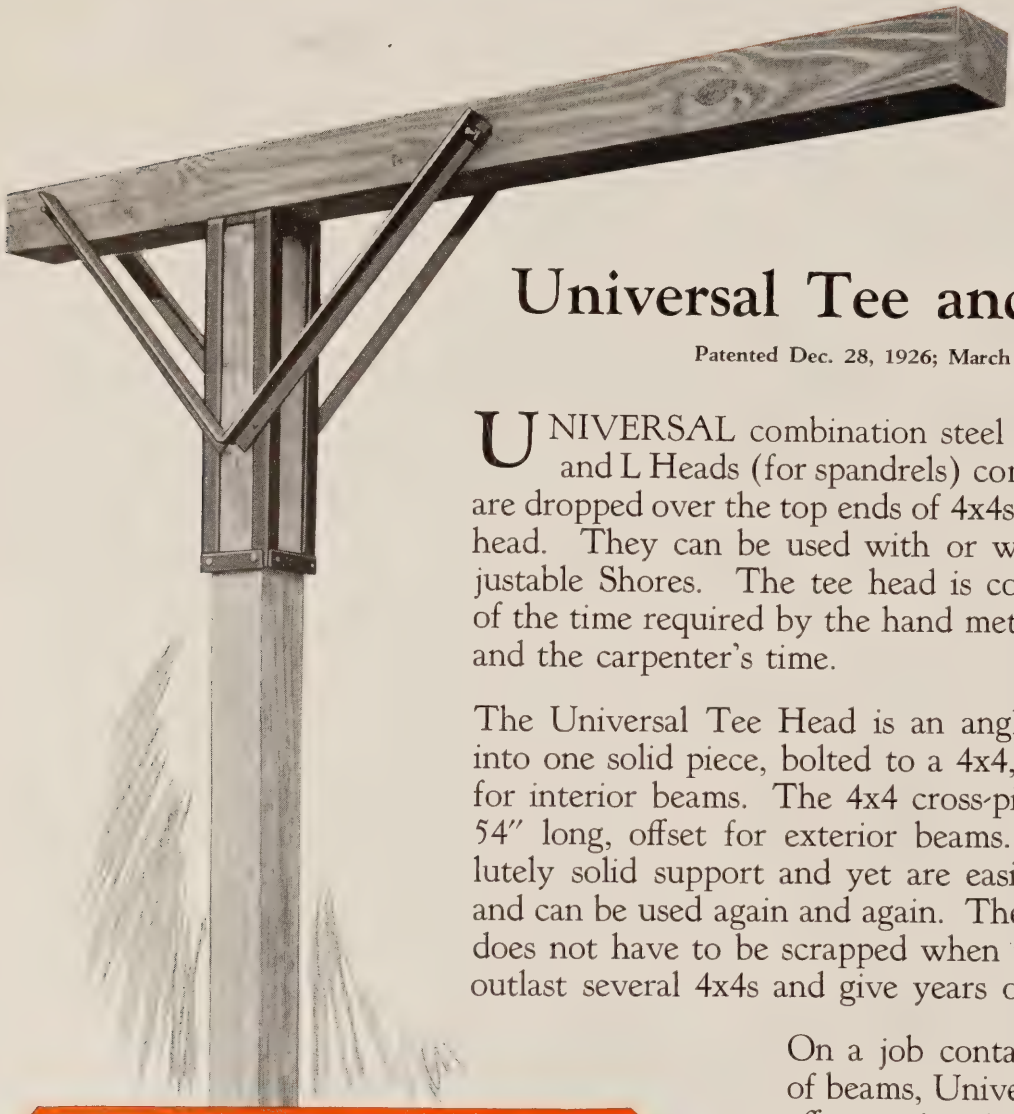
All the advantages that Universal Shores bring can be had at a very moderate investment. They can be rented with a three months' option to purchase and the rental will apply on the purchase price. This rental price is very low and hundreds of contractors have used and are using them on this basis. Many have taken advantage of the option and purchased at the end of three months. Others who had no immediate work on which to apply them returned them to us and rented them later when another job was in course of erection.



This lifting tool facilitates adjustment of shore when height to be gained is greater than range of jackscrew.



The shore is accurately adjusted to the fraction of an inch by turning the jackscrew at the base of the shore.



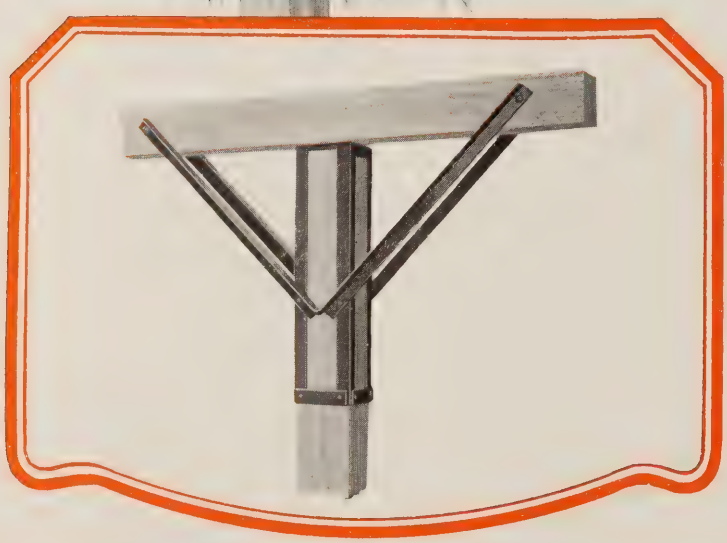
Universal Tee and L Heads

Patented Dec. 28, 1926; March 27, 1927.

UNIVERSAL combination steel and wood Tee Heads and L Heads (for spandrels) come ready to use. They are dropped over the top ends of 4x4s forming a finished tee head. They can be used with or without Universal Adjustable Shores. The tee head is completed in a fraction of the time required by the hand method and saves lumber and the carpenter's time.

The Universal Tee Head is an angle iron frame, riveted into one solid piece, bolted to a 4x4, 36" long and is used for interior beams. The 4x4 cross-piece of the L Head is 54" long, offset for exterior beams. They give an absolutely solid support and yet are easily slipped on and off and can be used again and again. The Universal Tee Head does not have to be scrapped when the 4x4 goes. It will outlast several 4x4s and give years of satisfactory service.

On a job containing a large number of beams, Universal Tee and L Heads effect savings in labor and lumber that grow to considerable proportions. A complete tee head can be assembled in one minute. When the tees are no longer needed they can be dismantled with the same speed, leaving only the plain 4x4s to be used either under slab shoring or beams on the next job.

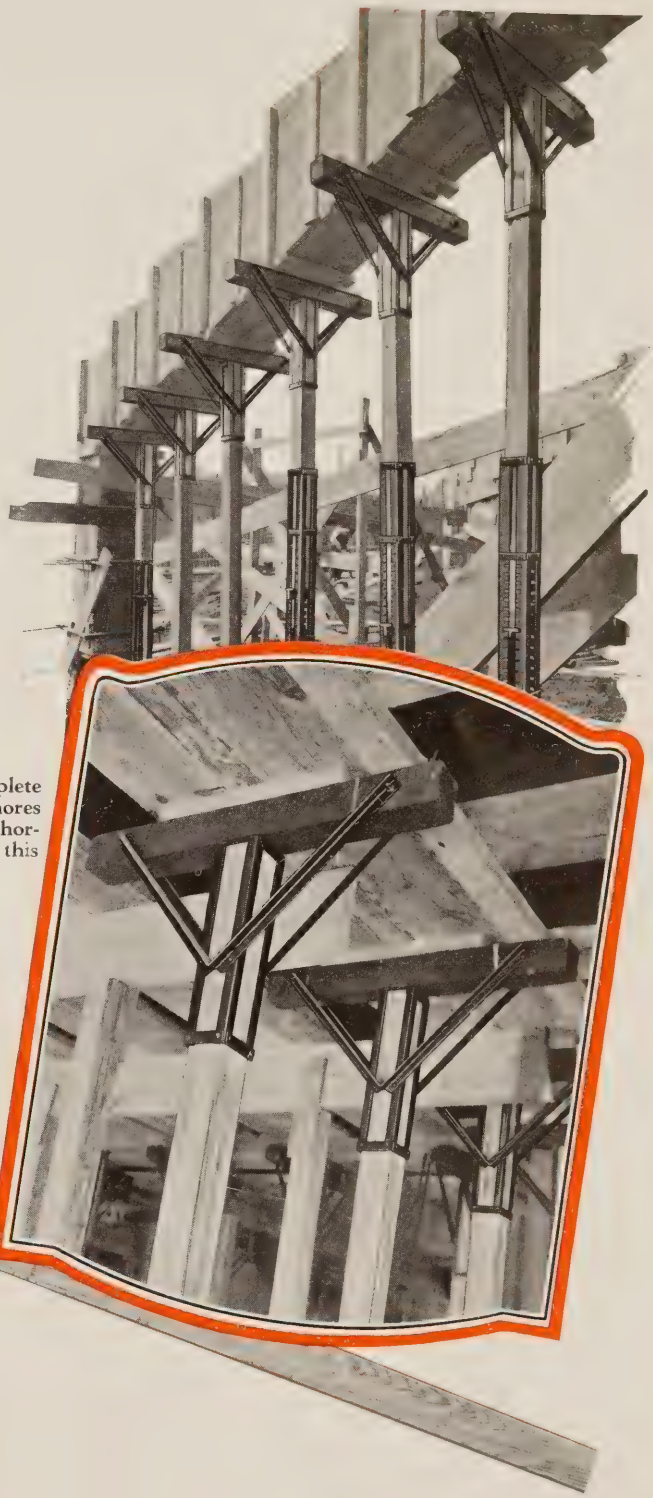


The solid one-piece Tee Head slips over the top end of the 4x4. The L Head is offset for exterior beams.

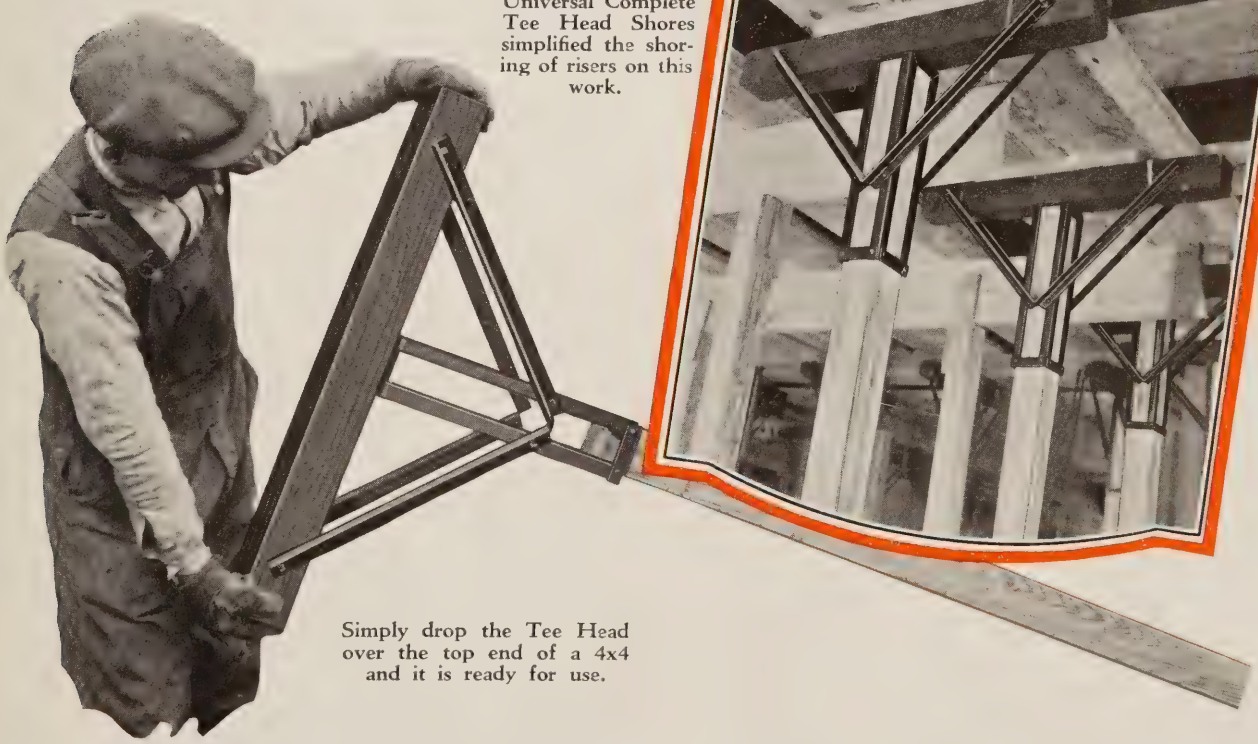
When hoisting a great many trips can be saved with Universal Tee Heads. One load of Tee Heads, and one load of plain posts equal in quantity six loads of built up heads when raising on a skip. Skip hoist time is valuable and it pays to hoist the heads and posts separately.

The Tee Heads take up little space and can be stored for future use. The savings in cartage represent another big saving. It's an expensive proposition to haul built-up Tee Heads back and forth from job to yard. 350 Universal Tee Heads can be hauled as against 125 built-up Tee Heads and posts on the same truck.

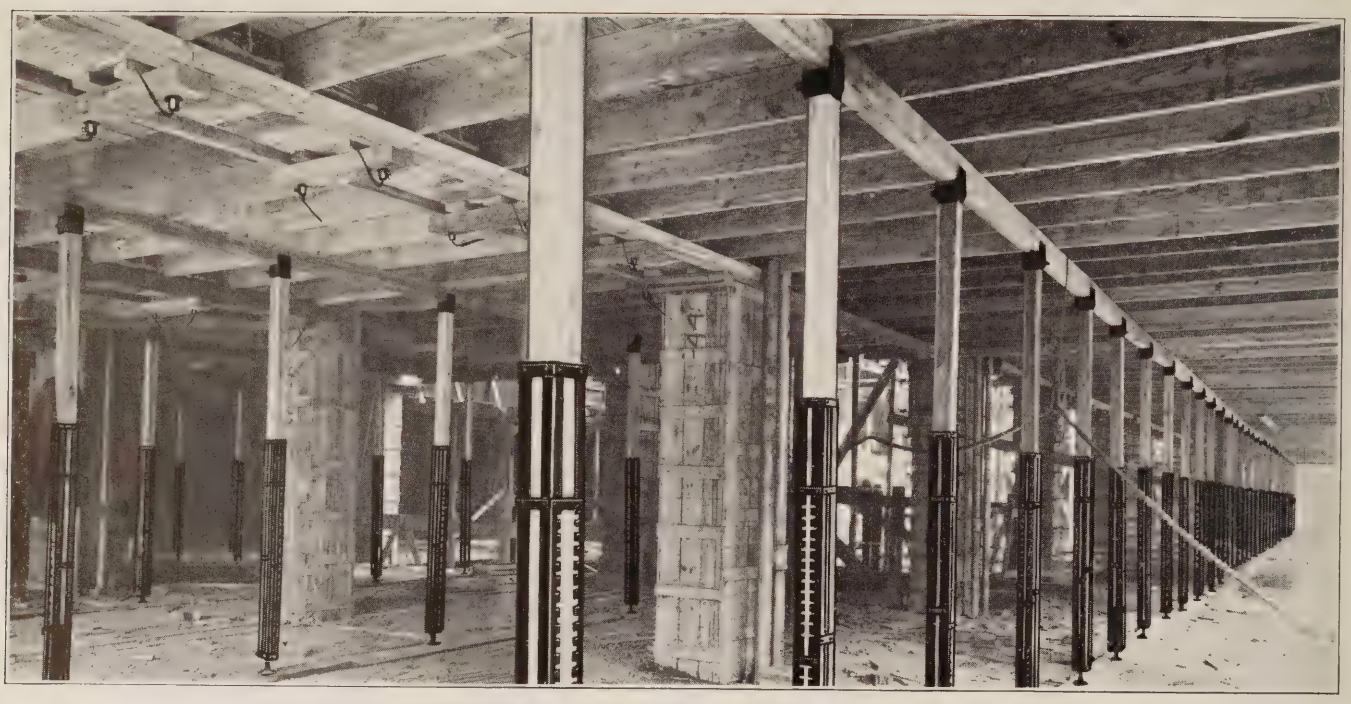
Universal Tee and L Heads can be rented on a monthly basis at a very moderate price with a three months' option to buy. The rental will apply on their purchase.



Universal Complete Tee Head Shores simplified the shoring of risers on this work.



Simply drop the Tee Head over the top end of a 4x4 and it is ready for use.



These Universal Post Caps hold the ledgers in place on the post without scabs or nails.

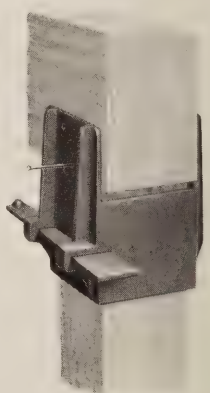
Universal Post Caps

Patented December 28, 1926. Other patents pending.

UNIVERSAL POST CAPS add considerably to the life of 4x4 shores and save the labor involved in nailing on scabs, or of cutting away 4x4 shores to receive the joist or ledger. The ends of the 4x4s are kept intact because no scabs are nailed to them every time they are erected. Universal Post Caps easily slip over the heads of 4x4 shores and provide a metal socket or chair to receive the joist or ledger. The cap is held in place on the shore by a wedge, integral with the casting, and remains on the shore as long as it is needed. If the same shore is used five different times on one building, it will not be necessary to scab this shore each time. The post cap eliminates this labor. No nails are needed to fasten the cap to the 4x4. Nail holes are provided in the brackets which hold the joist or ledger, but their use is optional and not necessary.

Universal Post Caps are made in two sizes — one for 2″ width lumber and the other for 4″ width lumber.

Universal Post Caps are made in two sizes. This is for 2″ lumber.



Universal Post Cap for 4″ lumber. Note the integral wedge for holding cap in place.

Design of Formwork

ONE of the largest items in the cost of concrete construction is the cost of the formwork, and for that reason it is very important that the forms should be scientifically and economically designed. They must be strong enough and stiff enough to carry the weight of the wet concrete and any other load which may come on them during construction without breaking or deflecting unduly.

The tables on page 38 will be found very valuable in determining the size and spacing of sheathing, joists, girts and posts. The spacings given are based on what experience has shown to be allowable safe values of the strength and deflection of the different members.

The forms should be designed for each particular job because the layout is affected by such special considerations as the size of the floor panels and the size of the lumber available. When these considerations have been determined, the tables may be used to assure that the forms shall be sufficiently strong and stiff without waste of lumber.

Example of Design of Forms for 6″ Slab

Decking. Using dressed lumber ¾″ thick, the maximum span for 6″ slab is given by the tables on page 38 as 25″.

Joists. Assume that the size of the panel is such that a 6-foot span of joists is desirable. The table shows that the maximum spacing for 2x6″ joists is 15½″, while that for 2x8″ joists is 29″. The 2x8″ joists will therefore be used spaced 25″ on centers, which is as much as the decking will allow.

Girts. For 6″ slab and 6′ joists span the table gives 4 feet 1 inch as the maximum span for 4x6″ girts. Since the girts can be made continuous for three spans, the span length can be increased 10%, which gives 4 feet 6 inches. The posts will therefore be spaced 4 feet 6 inches apart and 13-foot 6-inch girts can be used.

Posts. The area of forms to be supported by one post is equal to the joists span multiplied by the girt span, or 6 x 4½″ — 27 square feet. The table shows that a 3x4″ post provides the required bearing area, but 4x4″ posts will be adopted as being the minimum practicable size for ordinary work.

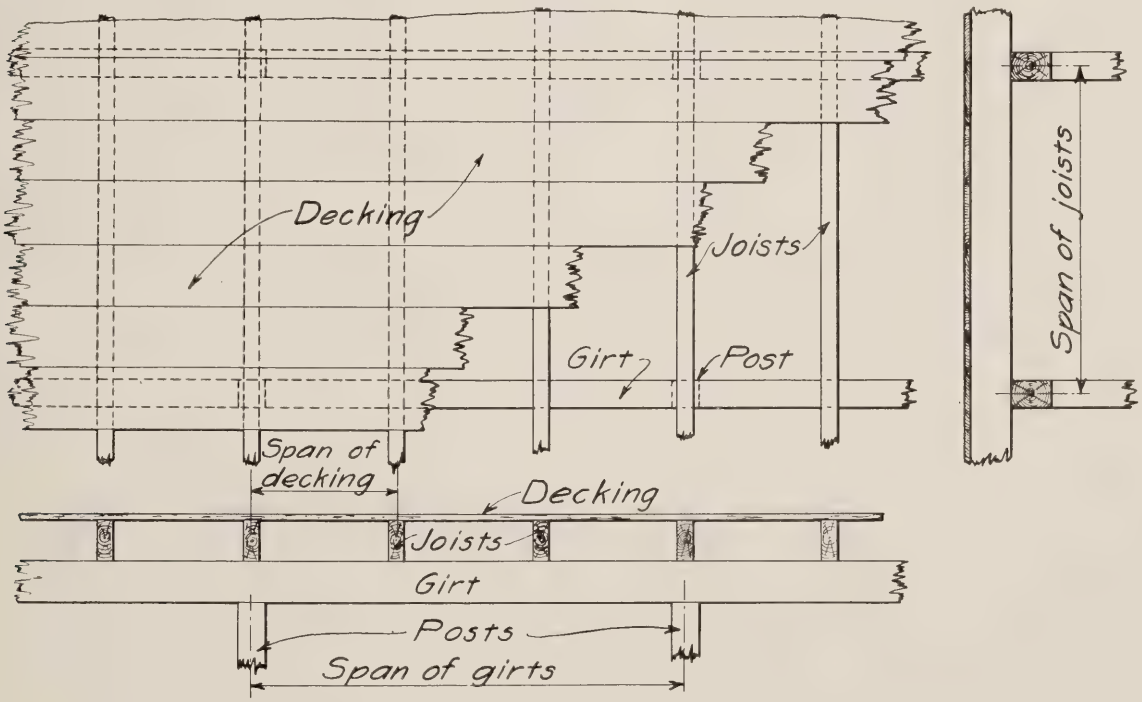


DIAGRAM OF SLAB FORMS

SLAB FORMS

MAX. SPAN OF GIRTS (ft. & in)

Max. moment = $\frac{1}{8}$ w s l² ÷ 12
w = weight of slab per sq. ft. plus 75 lb. per sq. ft. live load
s = span of joists in feet
l = span of girt in feet
Max. fiber stress = 1200 lb. per sq. in.
Max. deflection = $\frac{1}{360}$ l
For girts continuous for 3 or more spans, max. span is 10% greater than given
For girts 6" wide, max. span is 20% greater than span for girts 4" wide

Thickness of slab, and "w"		4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Size of girt	Span of joists									
3·6 (2¾"·5¼")	4'	4-9	4-6	4-4	4-2	4-0	3-11	3-9	3-8	3-6
	5'	4-3	4-0	3-11	3-9	3-7	3-5	3-4	3-3	3-2
	6'	3-11	3-9	3-6	3-4	3-3	3-2	3-1	3-0	2-11
	7'	3-7	3-5	3-3	3-1	3-0	2-11	2-10	2-9	2-8
	8'	3-4	3-2	3-1	2-11	2-10	2-9	2-8	2-7	2-6
	9'	3-2	3-0	2-11	2-9	2-8	2-7	2-6	2-5	2-4
	10'	3-0	2-11	2-9	2-7	2-6	2-5	2-4	2-4	2-3
	11'	2-11	2-9	2-7	2-6	2-5	2-4	2-3	2-2	2-2
	12'	2-9	2-7	2-6	2-5	2-4	2-3	2-2	2-1	2-1
4·6 (3¾"·5½")	4'	5-6	5-3	5-1	4-10	4-8	4-6	4-5	4-3	4-2
	5'	4-11	4-8	4-6	4-4	4-2	4-0	3-11	3-10	3-8
	6'	4-6	4-4	4-1	3-11	3-10	3-8	3-7	3-6	3-4
	7'	4-2	4-0	3-10	3-8	3-6	3-5	3-4	3-2	3-2
	8'	3-11	3-9	3-7	3-5	3-4	3-2	3-1	3-0	2-11
	9'	3-8	3-6	3-4	3-3	3-1	3-0	2-11	2-10	2-9
	10'	3-6	3-4	3-2	3-1	2-11	2-10	2-9	2-8	2-7
	11'	3-4	3-2	3-0	2-11	2-10	2-9	2-8	2-7	2-6
	12'	3-2	3-0	2-11	2-10	2-8	2-7	2-6	2-5	2-5
4·8 (3¾"·7¼")	4'	7-6	7-2	6-11	6-7	6-4	6-2	5-11	5-9	5-7
	5'	6-9	6-5	6-2	5-11	5-8	5-6	5-3	5-2	5-0
	6'	6-2	5-10	5-7	5-5	5-2	5-0	4-10	4-9	4-7
	7'	5-8	5-5	5-2	5-0	4-10	4-8	4-6	4-4	4-3
	8'	5-4	5-1	4-11	4-8	4-6	4-4	4-2	4-1	4-0
	9'	5-0	4-9	4-7	4-5	4-3	4-1	4-0	3-10	3-9
	10'	4-9	4-6	4-4	4-2	4-0	3-11	3-9	3-8	3-7
	11'	4-6	4-4	4-2	4-0	3-10	3-8	3-7	3-6	3-5
	12'	4-4	4-2	4-0	3-10	3-8	3-7	3-5	3-4	3-3
4·10 (3¾"·9¼")	4'	9-6	9-1	8-8	8-4	8-1	7-9	7-6	7-3	7-1
	5'	8-6	8-2	7-9	7-5	7-2	6-11	6-9	6-6	6-4
	6'	7-9	7-5	7-1	6-10	6-6	6-4	6-2	5-11	5-9
	7'	7-2	6-11	6-7	6-3	6-1	5-11	5-8	5-6	5-4
	8'	6-9	6-5	6-2	5-10	5-8	5-6	5-4	5-2	5-0
	9'	6-4	6-0	5-9	5-7	5-4	5-2	5-0	4-10	4-9
	10'	6-0	5-9	5-5	5-3	5-1	4-11	4-9	4-7	4-6
	11'	5-9	5-6	5-2	5-0	4-10	4-8	4-6	4-5	4-3
	12'	5-6	5-3	5-0	4-10	4-8	4-6	4-4	4-3	4-1

MAX AREA OF SLAB SUPPORTED BY ONE POST (sq ft)

Bearing perpendicular to grain of girt = 400 lb. per sq. in.
Width of girt assumed to be same as width of post.

Thickness of slab, and "w"	4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Size of post									
3·4 (2¾"·3¼")	33	30	27	25	23	22	20	19	18
4·4 (3¾"·3¼")	45	41	37	34	32	30	28	26	25
4·6 (3¾"·5½")	66	60	55	51	47	44	41	39	37
6·6 (5½"·5½")	97	88	81	74	69	64	60	57	53

SLAB FORMS

MAX. SPAN OF DECKING (inches)

Max. moment = $\frac{1}{10}$ $\frac{lb}{sq\ in}$ l²
w = weight of slab per sq. ft. plus 75 lb. per sq. ft. live load
l = span of decking in inches
Max. fiber stress = 1200 lb. per sq. in.
Max. deflection = $\frac{1}{8}$ in.

Thickness of slab, and "w"	4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Actual thickness of decking									
¾"	26	25	25	24	24	24	23	23	23
⅞"	29	29	28	27	27	26	26	26	25
1"	32	32	31	30	30	29	29	28	28
1⅛"	35	34	34	33	33	32	31	31	30
1¼"	38	37	37	36	35	35	34	33	32
1⅜"	47	46	45	44	43	42	41	41	40

MAX. SPACING OF JOISTS (inches)

Max. moment = $\frac{1}{8}$ w s l²
l = span of joist in feet
s = spacing in inches
Max. fiber stress = 1200 lb. per sq. in.
Max. deflection = $\frac{1}{360}$ l
For joists 3" wide multiply given spacing by 1.5
" " 4" " " " " 2.0

Thickness of slab, and "w"		4" 125 lb/sq ft	5" 138	6" 150	7" 163	8" 175	9" 188	10" 200	11" 213	12" 225
Size of joist	Span (ft)									
2·4 (1½"·3½")	4	17	15½	14	13	12	11½	10½	10	9½
	5	11	10	9	8½	8	7	7	6½	6
	6	7½	7	6						
2·6 (1½"·5½")	4	42	38	35	32	30	28	26	25	24
	5	27	25	22½	21	19½	18	17	16	15
	6	19	17	15½	14½	13½	12½	12	11	10½
	7	14	12½	11½	10½	10	9	8½	8	7½
	8	10½	9½	8½	8	7½	7	6½	6	
	9	8½	7½	7	6½	6				
	10	6								
2·8 (1½"·7½")	5	50	46	42	39	36	34	31	30	28
	6	35	32	29	27	25	23	22	20	19
	7	25	23	21	20	18	17	16	15	14
	8	19	18	16½	15	14	13	12	11½	11
	9	15½	14	13	12	11	10½	9½	9	8½
	10	12½	11½	10½	9½	9	8½	8	7½	7
	11	10½	9½	8½	8	7½	7	6½	6	6
	12	8½	8	7½	6½	6				
2·10 (1½"·9½")	6	56	51	47	43	40	37	35	33	31
	7	41	37	34	31	29	27	26	24	23
	8	32	29	26	24	22	21	20	18½	17½
	9	25	23	21	19	18	16½	15½	14½	14
	10	20	18½	17	15½	14½	13½	12½	12	11
	11	16½	15	14	13	12	11	10½	10	9
	12	14½	13	11½	11	10	9½	9	8	8
2·12 (1½"·11½")	7			50	46	43	40	38	35	34
	8	46	42	38	35	33	31	29	27	26
	9	37	33	30	28	26	24	23	21	20
	10	29	27	25	23	21	20	18½	17½	16½
	11	24	22	20	19	17½	16	15½	14½	13½
	12	20	18½	17	16	14½	13½	13	12	11½

UNIVERSAL
Used by the Nation's Construction Engineers

When Ordering Spacers and Chairs note:—

HEIGHTS, lengths, and sizes of Bar Spacers and Chairs are shown on page 44. Slab and Beam Bar Spacers can be ordered in two ways. The structural plans can be sent to us; we will estimate the quantities which we believe are necessary, based on long experience in this work. We will then quote a lump sum price, naming these quantities, and upon receipt of your order, detail the spacers, and mark the plans for their location, and return them to you.

Again, lists can be sent us showing number of bars, spacing, height, etc., and you will be quoted accordingly.

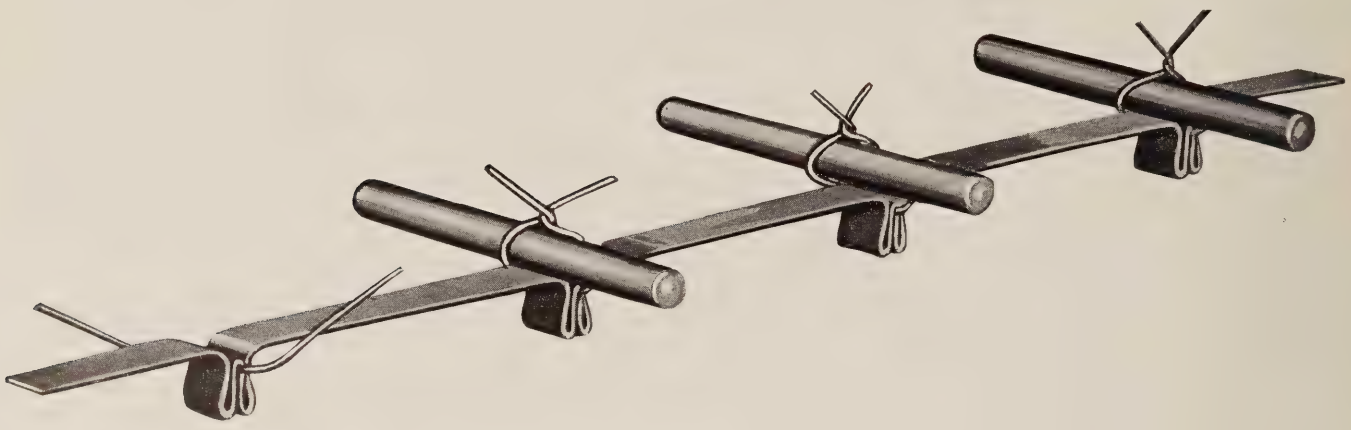
Our standard practice is to furnish the following quantities: For one-way slabs, two strips of Lower Slab Spacer per panel. For two-way slabs, two strips of Lower Slab Bar Spacer per panel, two strips of Upper Bar Spacer for upper layer of bars being furnished only when specified. For two-way flat slab construction, two strips of Lower Slab Bar Spacer for each direct and intermediate band of bars, Upper Spacer for the upper layer of intermediate bars being furnished only when specified. In four-way flat slab construction, two strips of Lower Slab Bar Spacers are furnished for each direct band, and two for the lower layer of diagonal bars; Upper Spacers furnished for upper layers of diagonals when specified. Two joist spacers and two beam spacers per joist, and per beam and lintel, are furnished where clear spans are not over 16 feet. An additional spacer is furnished for each additional 6 feet of clear span over 16 feet. Size of bars in beams should be given.

Six to ten High Chairs are necessary around column heads in flat slabs, and two to four for support bars holding up top or bent bars. The number of chairs should be specified.

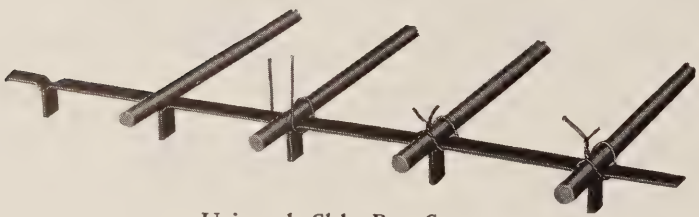
Bar Chairs, High Chairs, and Joist Spacers can be ordered by quantity, specifying height of chairs for High Chairs, and width, number of bars, and height for Joist Spacers.

Universal Slab Bar Spacers

Patented Oct. 15, 1918, Jan. 9, 1923

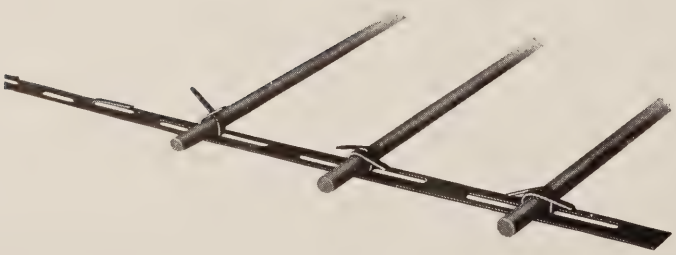


Universal Slab Bar Spacer
with tie wires



Universal Slab Bar Spacer
without tie wires

Welded Wire Slab
Bar Spacer



Upper Slab Bar Spacer

UNIVERSAL SLAB BAR SPACERS with tie wires provide substantial support for slab reinforcement. There is a leg of double folded metal that will stand heavy loads and prevent wedging action under the bars. This spacer is made up in various heights from 1/2" to 1 1/2" in exact conformation with the specifications of each job, spacing the bars at correct intervals and heights.

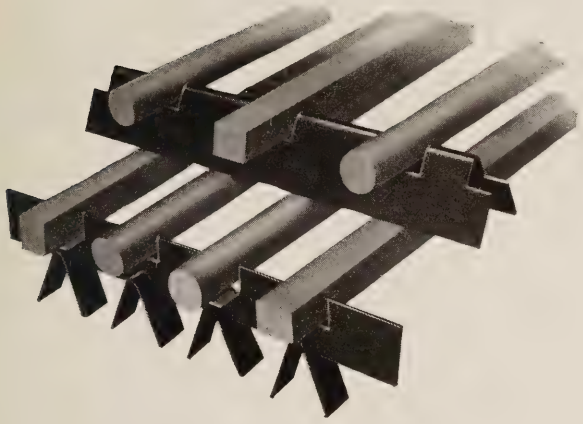
Universal Slab Bar Spacers are also furnished without tie wires as shown. Many contractors and steel setters prefer to use their own tie wire. One type is made of formed hoop steel; the other of welded wire. Both are fabricated according to order and come in heights from 1/2" to 1 1/2". All Universal Bar Spacers are fabricated from the details of each individual plan. They are tagged with designating marks showing exactly in what portion of the building they are to be used. They are shipped in compact bundles that can be handled conveniently.

Universal Upper Slab Bar Spacers space the bars at correct intervals, but do not support them. They are used for bars in the top of the slab and for upper layers of reinforcement in flat slabs wherever accurate spacing is desired.

Heights, weights, etc., are on page 44.

Universal Beam Bar Spacers

Patented May 7, 1918

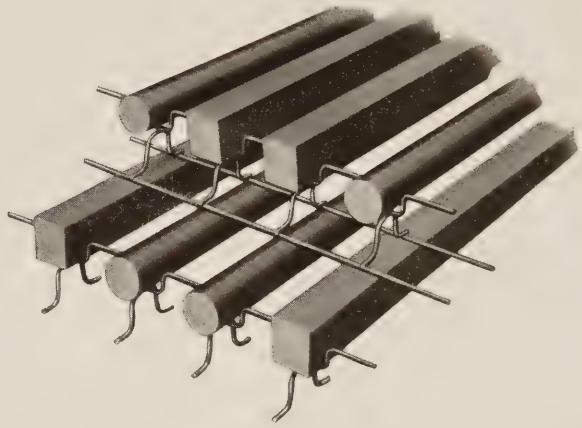


UNIVERSAL BEAM BAR SPACERS are designed to properly support and space the bars in each individual beam as to height, width of beam and number of bars per beam. The shelves under the bars in the Style C (lower) Spacer are bent out alternately. This gives stability to the spacer and prevents it from tipping when bars are pulled back and forth in the beams.

Style E (upper) Spacer or Separator provides for the upper layer of bars. It rests on the lower bars and can be placed anywhere on top of them. See heights on page 44.

Universal Beam Bar Spacers

Patented January 17, 1928

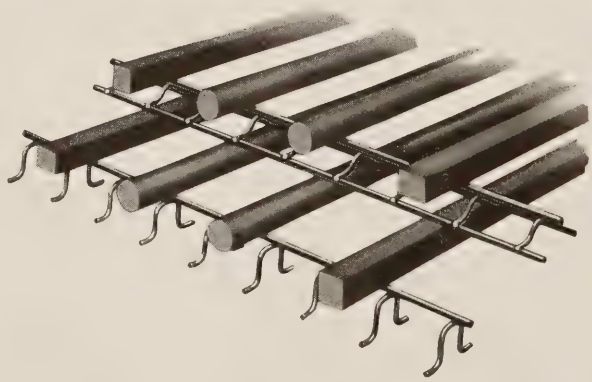


UNIVERSAL BEAM BAR SPACERS are also made of formed wire with supporting legs firmly welded under every bar. These Beam Spacers are designed to properly space the bars in the same manner as the sheet metal Spacer. The wide spread of the legs gives excellent stability. The separator has two heavy wires welded along the legs, which support this upper spacer on the lower layer of bars. If a wire Beam Spacer is desired, the type shown above will be found unequaled. Heights and weights are shown on page 44.

Universal Beam Bolster

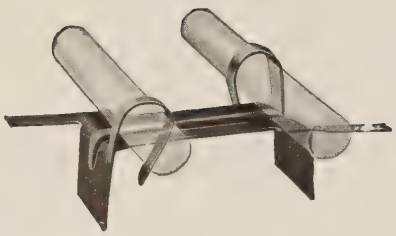
UNIVERSAL BEAM BOLSTER supports the steel in beams and girders, but does not space it laterally. Because there is no definite lateral spacing, this bolster can be shipped from stock to the job and there cut to length. It allows the steel setter the widest latitude in the number and location of supports, and because it contains no definite notches or arms for the bars, can be used in any beam or girder. Universal Beam Bolster can and should be carried in stock by every dealer and jobber handling bar spacers. The upper bolster or separator, like Universal Upper Beam Spacer, is placed anywhere along the top of the lower layer of bars.

Universal Beam Bolsters, both upper and lower, are made in 5-foot lengths and in heights to support the bar from 1½″ to 3½″ above forms. See heights on page 44.



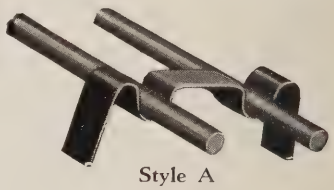
Universal Joist Bar Spacers

Patented February 12, 1918



Style B

UNIVERSAL JOIST BAR SPACERS are furnished in two forms as shown here. These joist bar spacers are adaptable to any type of ribbed floor construction and are made to carry one or two bars. Style A provides a deep groove in which the bars are laid and properly spaced. Style B has metal arms which can be bent back to hold the rod firmly in place. Like all other Universal products, Universal Joist Spacers are designed for strength and simplicity. Heights and weights shown on page 44.

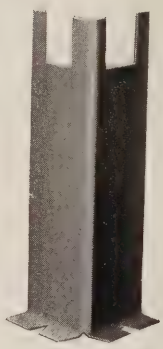


Style A

Universal High Chairs

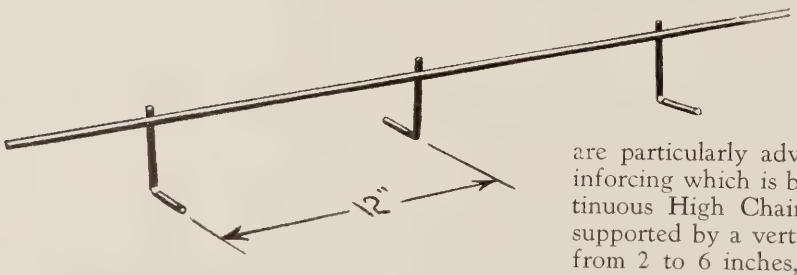
Patented December 21, 1920

UNIVERSAL HIGH CHAIRS give a strong support for the bars around the column heads and in the top of slabs. In addition to their stability, they are light in weight and take up little space, insuring the flow of concrete. The shelves at the bottom are provided with notches for nailing, thus making certain that the chairs are always in place. From six to ten chairs per interior column are necessary. Height is figured from the bottom of the chair to the underside of support bar. Weights are given on page 44.



Universal Continuous Hi-Chairs

Patent Applied For



UNIVERSAL CONTINUOUS HIGH CHAIRS are used for the same purpose as the individual High Chair shown above. When the Continuous Chair is used no support bars are required. They are particularly advantageous in the support of mesh or slab reinforcing which is brought to the top of the slab over beams. Continuous High Chairs are made in five ft. lengths of heavy rod supported by a vertical leg every 12 inches. The spread of legs is from 2 to 6 inches, depending on the height. It is made in any height from 2 to 6 inches.

Universal Individual Bar Chairs

Patented February 12, 1918

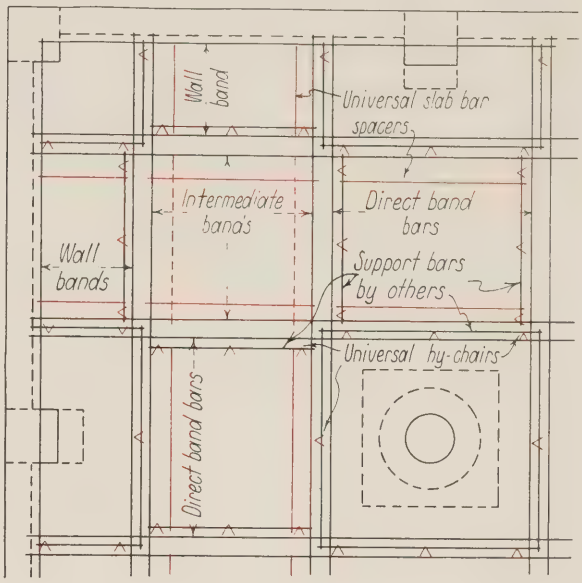
UNIVERSAL BAR CHAIRS support miscellaneous bars on work where it is not practical or convenient to use Slab Bar Spacers; for example, for bars placed fanwise or in any irregular manner. Universal Bar Chairs can be furnished with nail holes at a slightly additional cost. So punched, they are used to hold reinforcing steel away from wall forms. Sizes and weights are given on page 44.

Typical Method of Placing Universal Slab Bar Spacers and High Chairs for Slab Bars in Bands in Two-Way Flat Slab Construction

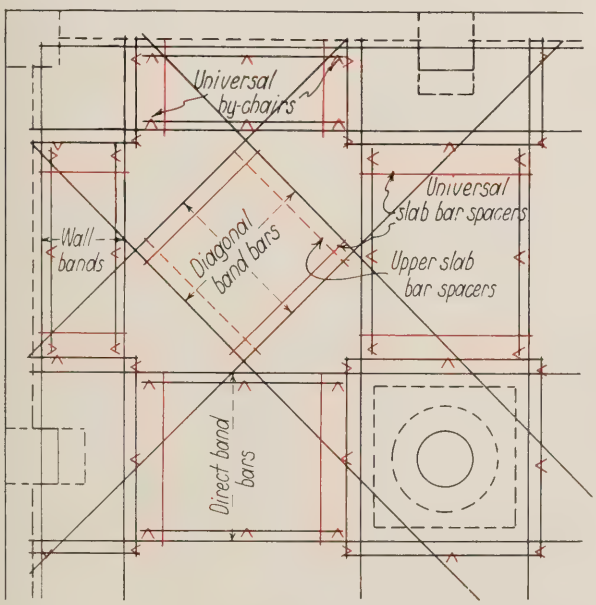
Use two strips of Universal Lower Slab Bar Spacer in each direct and intermediate band of bars, except in unusually large panels, where three should be placed.

Use two strips of Universal Upper Slab Bar Spacer for upper layer of bars in intermediate bands, when accurate spacing is desired. These bars are already supported by the bars below.

Use three Universal High Chairs per support bar.



Typical Method of Placing Universal Slab Bar Spacers and High Chairs for Slab Bars in Bands in Four-Way Flat Slab Construction



Use two strips of Universal Lower Slab Bar Spacer in each direct and diagonal band of bars, except in unusually large panels, where three should be placed.

Use two strips of Universal Upper Slab Bar Spacer for upper layer of bars in diagonal bands when accurate spacing is desired. These bars are already supported by bars below.

Use three Universal High Chairs per support bar.

Data on Spacers and Bar Chairs

Slab Bar Spacers

Lower Slab Bar Spacers are made to give a clearance between the bottom of the steel and the form of ½", ¾", 1", 1¼" and 1½". The first three heights are standard, an extra charge being made for the 1¼" and 1½" heights.

The minimum spacing of bars for standard heights is 2"; for special heights 4". The length of strip is limited to about 20', due to the difficulty in handling and shipping longer strips.

Welded Slab Bar Spacers come in lengths not to exceed 12 feet. They can be furnished in any spacing and height.

Upper Slab Bar Spacer

The minimum spacing on Upper Spacer is 4". The maximum length is the same as for the Lower Slab Spacer.

Beam Bar Spacers

Beam Bar Spacers, Type C, for lower or single layer of bars in beams. are made in two standard heights, to give 1½" and 2" clear between the bottom of the steel and the form. Special heights up to 3" can be furnished at an additional cost. The above also applies to Type E, except that standard distance between layers of bars is 1".

Wire Beam Bolster

The Universal Wire Beam Bolster is furnished in 5-foot lengths, 100 feet to the bundle. The standard heights of the lower type bolster are 1½" and 2"; of the upper bolster, 1". It can be supplied in 1" heights and also up to 3½" in height. The 1½" and 2" high lower bolster and 1" upper bolster are shipped from stock. Special heights are shipped within one week from receipt of order.

Joist Bar Spacers

Joist Bar Spacers are made in the following widths and heights, the latter being from bottom of steel to form:

Style	Width	Height	No. of Bars
A	6"	1½", 1", ¾"	2
A	5"	1½", 1", ¾"	2
A	4"	1" and ¾"	1 and 2
B	6"	1" and ¾"	2
B	5"	1", ¾", ½"	2
B	4"	1", ¾", ½"	1 and 2

We recommend Style A Spacers for general use.

Bar Chairs

Individual Bar Chairs are stocked as follows:

No.	Height	Take Bar
2	¾"	1 "
3	1 "	1½"
3	1½"	1½"
3	2 "	1½"

High Chairs and Screed Chairs can be furnished in any height.

Weights of Bar Spacers and Chairs

Lower Slab Bar Spacers—1" high	Weight per 1000 feet	210	Lbs.
Upper Slab Bar Spacers	" " " "	150	"
Beam Bar Spacers, Style C—1½" high	" " " "	500	"
Beam Bar Spacers, Style E—1" high	" " " "	650	"
Wire Beam Bar Spacers, upper and lower	" " " "	275	"
Beam Bolsters—1½" high	" " " "	350	"
Joist Bar Spacers, Style A—6" wide, 1" high	Weight per 1000 pieces	195	"
Joist Bar Spacers, Style A—5" wide	" " " "	165	"
Joist Bar Spacers, Style A—4" wide	" " " "	135	"
Joist Bar Spacers, Style B—5" wide	" " " "	100	"
Joist Bar Spacers, Style B—4" wide	" " " "	85	"
Bar Chairs— ¾" high	" " " "	60	"
Bar Chairs—1½" high	" " " "	85	"
Bar Chairs—2" high	" " " "	100	"
High Chairs—6" high	" " " "	380	"
Screed Chairs—6" high	" " " "	390	"

Extra charges made for crating Slab Bar Spacers for express shipment.

Universal Screed Chairs

Patented December 21, 1920

UNIVERSAL SCREED CHAIRS are made on the same general principle as Universal High Chairs, but have two notches in the top of the chair for supporting the screed bar. This chair is light and strong, easily and quickly placed. It is nailed to the form by means of a notch in the shelves at the base of the chair and is held firmly in place while the concrete is being poured. For the screed, a metal bar 5/16″x1½″ or 2″ is used in the top notches provided for it. Because of the deep section of the screed bar, few chairs are needed for a rigid support without deflection. Three chairs are sufficient for a 14-foot bar.

After the screed is no longer required, the bar can be easily lifted from the chair, leaving practically no depression in the slab, which is not the case when a thick wooden screed is used. Screed bars can be used over and over while the chairs remain in the slab. A trial of these screed chairs will prove their economy and efficiency.

In ordering, give height of chair as distance from bottom of screed bar to bottom of chair.

Sizes and weights of Screed Chairs are given on page 44.

UNIVERSAL Anchor Slots

The Modern Method—

of anchoring brick, terra cotta, stone and tile to concrete . . . .

THE Universal Anchor and Slot furnishes the modern method of tying brick, terra cotta, stone, and tile to concrete. Simple, fast, and easy—all that is required is to nail the slot to the inside face of the form, and insert anchors in the slot, which remain imbedded in the concrete. Greater strength and safety, with less time and trouble than with the old system of fixed anchors, are obtained. And because these advantages combine to bring about better jobs at lower cost, Universal Anchors and Slots are supplanting the old, unsatisfactory methods of masonry anchoring all over the country.

No Measuring of Course Heights

Simply installed, no accurate measuring and laying out of course heights is required. As the masonry is built up, an anchor is inserted in the slot at convenient course heights. A twist of the wrist puts the anchor in place.

Boring of Forms Eliminated

Construction costs are cut because there are no holes to be bored in the forms and no complex system of wires to be strung. Time and labor in stripping forms are greatly reduced, and the forms left unmarred by holes, considerably increasing their values for re-use or sale.

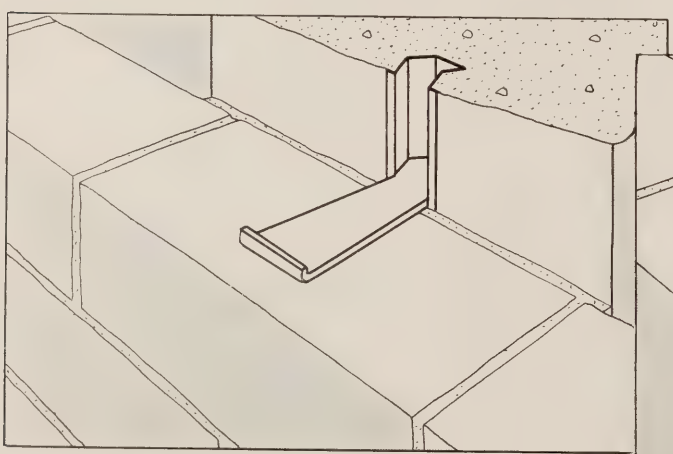
Concrete Drilling Not Needed

Labor costs and the time for setting the masonry are lowered also. No drilling of concrete is needed and there is no need for bending of fixed anchors that do not come at the correct course heights.

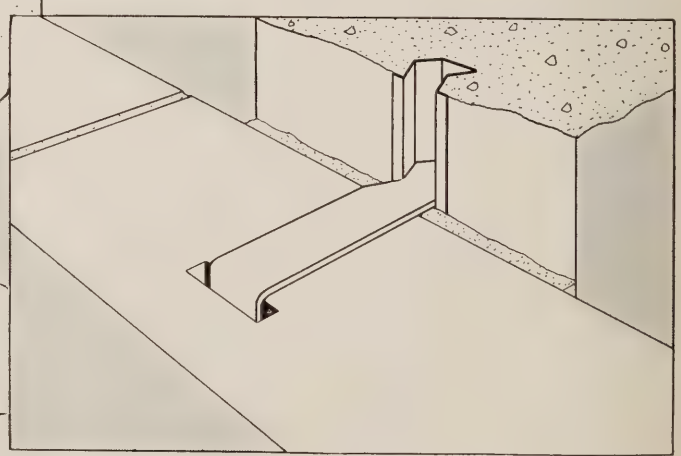
Method of Installing

The slots are quickly and easily placed. The proper length to fit the height of the form is nailed vertically to the inside face of the outside form, as shown. The slot should be installed so that the angles point to the right in the finished concrete, to the left when being nailed to the form. In spandrels, beams and other horizontal forms several lengths are cut to fit the height of the form and nailed vertically as for columns. One slot should be placed for every 16 inches of width in columns, and span in beams and spandrels. When the forms are stripped, the ends of the small wire nails projecting are easily clipped or bent in if they interfere with the placing of the masonry.

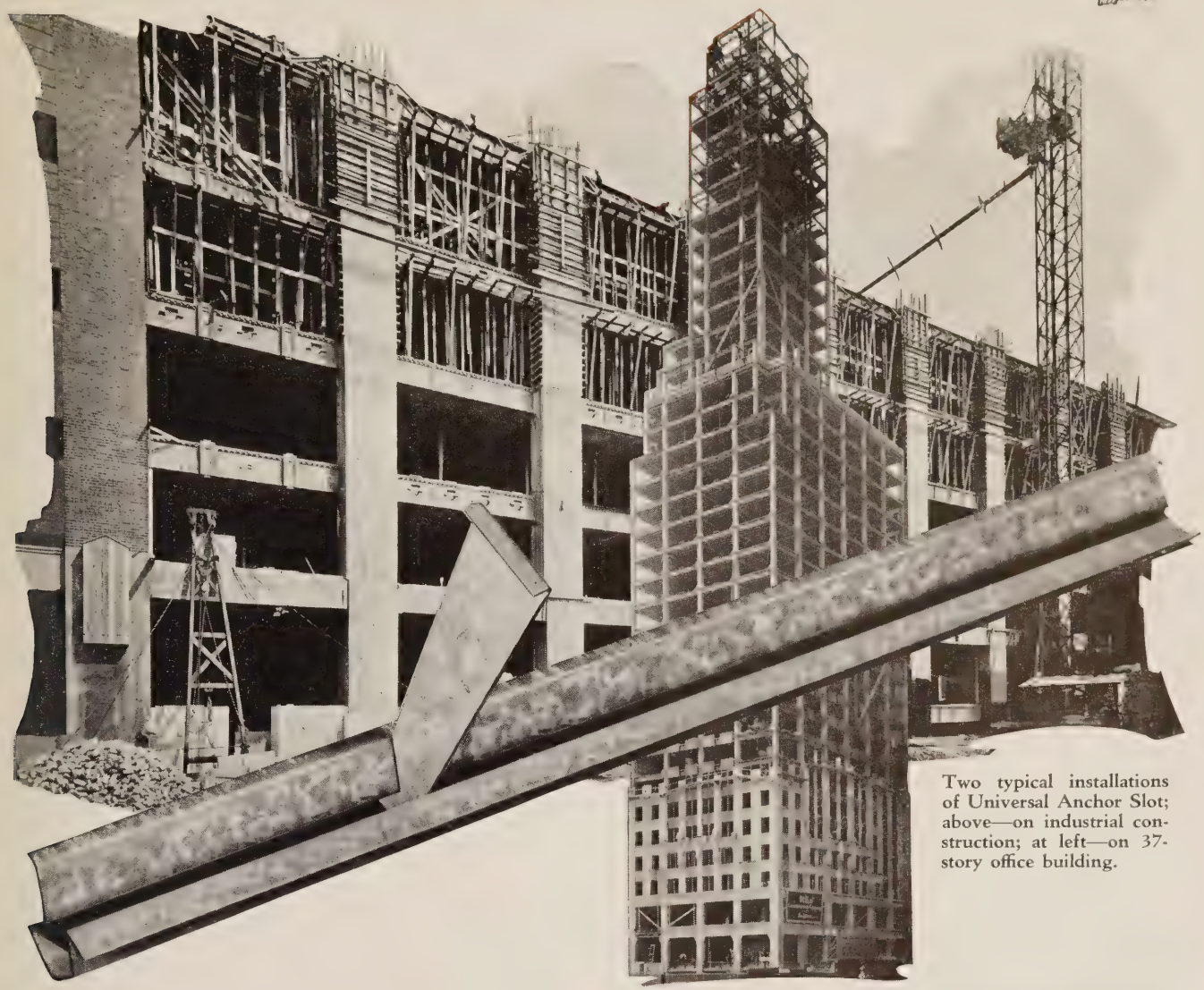
By eliminating the measuring of course heights, boring of forms, and drilling of concrete, among many other advantages, Universal Anchors and Slots make really worth-while savings in construction costs.



Anchoring brick to concrete. The anchor can be inserted at any height desired.

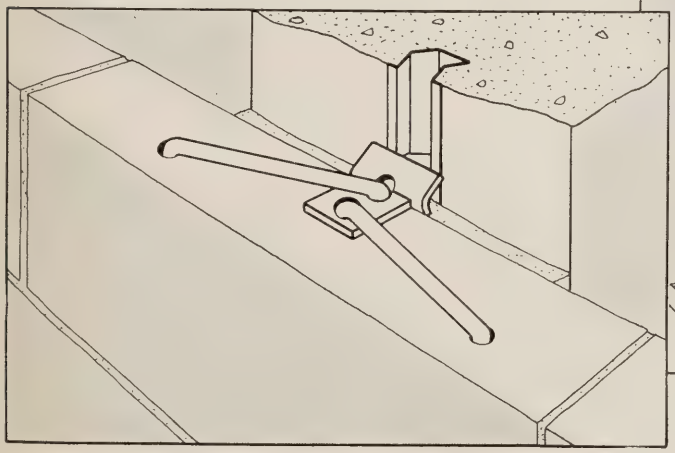


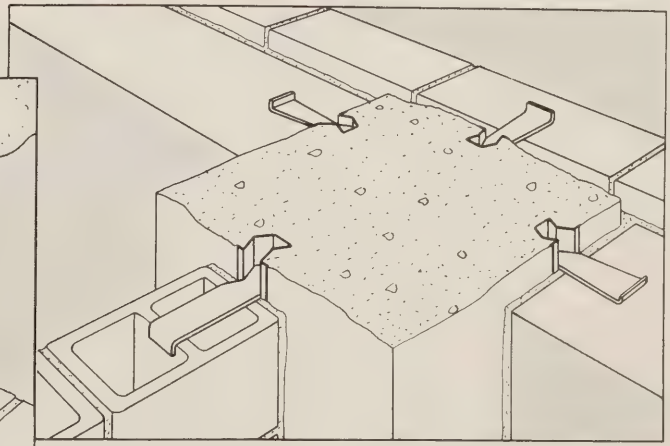
Anchoring stone to concrete. A twist of the wrist puts the anchor in the slot at any course height.



Two typical installations of Universal Anchor Slot; above—on industrial construction; at left—on 37-story office building.

Anchoring terra cotta and tile to concrete. Two rods placed in holes in the anchor which may be inserted at any height hold the terra cotta or tile tightly to the concrete.



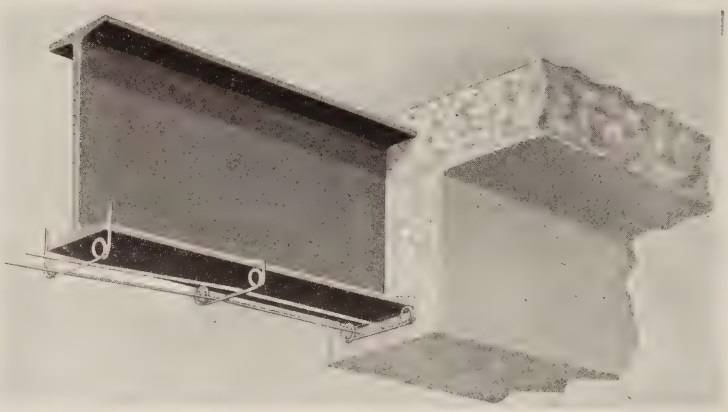


Anchors in columns with brick facing, backing and tile partitions, showing the versatility of Universal Anchors and Slots.

Reed Soffit Clips

For Steel Beams, Girders and Columns and Absolute Insurance Against Defective Soffits.

WHERE structural steel members are to be fireproofed with concrete, good practice demands that they be provided with some form of clip which will prevent failure of concrete along the lower flanges of such members. Reed Clips, in the most simple and scientific manner, insure against failure. The cross members are offset 1″ by loops, thereby furnishing a bond sufficient to thoroughly reinforce the concrete. One or more longitudinal wires hold the cross-wires in place by welds. The cross-wires do not project beyond the flange and, therefore, offer no obstruction in the pouring of concrete, nor can they be dislodged by ramming and tamping.



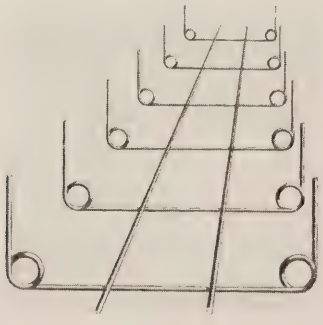
Reed Clips are offset, absolutely preventing failure.

Reed Clips are strongly made of No. 12 gauge wire electrically welded. They are light in weight, easily shipped and stored, and most easily applied. They permit the worker to keep his work ahead of him the entire length of the steel member. The mechanic never leaves his position for any one beam, girder or column. He simply bends each clip over the flange and shoves the fabric ahead the required distance.

Reed Clips come in 5 ft. lengths with clipping members spaced 12″ apart. One or more longitudinal wires are used, depending on the width as follows:

Flange Width	Space of Clips	No. of Longitudinals	Length of Projecting Wires
3″ to 8″	12″	1	2½″
9″ to 15″	12″	2	4″
16″ to 20″	12″	3	6″
21″ to 26″	12″	4	6″

The above may be altered at slight expense to meet special requirements. Reed Clips are shipped in bundles of 5 ft. lengths and 250 ft. per bundle. When shipped by freight or express, they are well crated.



Reed Clips with two longitudinal members.

To Order Reed Clips

The following table gives the width of Clip required for standard I-beams of various sizes:

Size of I-Beam	Weight	Width of Clip
3″	Any	3″
4″	"	3″
5″	"	3″
6″	"	3″
7″	"	4″
8″	"	4″
9″	21-25 Lbs.	4″
9″	30-35 Lbs.	5″
10″	Any	5″
12″	"	5″
15″	"	6″
18″	55-70 Lbs.	6″
18″	75-90 Lbs.	7″
20″	65-81 Lbs.	6″
20″	85-100 Lbs.	7″
24″	79-100 Lbs.	7″
24″	105-120 Lbs.	8″

To order clips for Bethlehem and Carnegie sections and trusses, girders or columns, state the size and weight and type of section, or the width of the flange. For channels state size of section.

THE Universal Form Clamp Co. offers a choice of two styles of Continuous Sleeper Anchors. Five or six individual anchors are firmly welded to a connecting wire or wires, so that with one operation, requiring little longer than the setting of a single anchor, five or six anchors are inserted, properly spaced. Instead of moving a template plank five times for five rows of anchors, it is moved once.

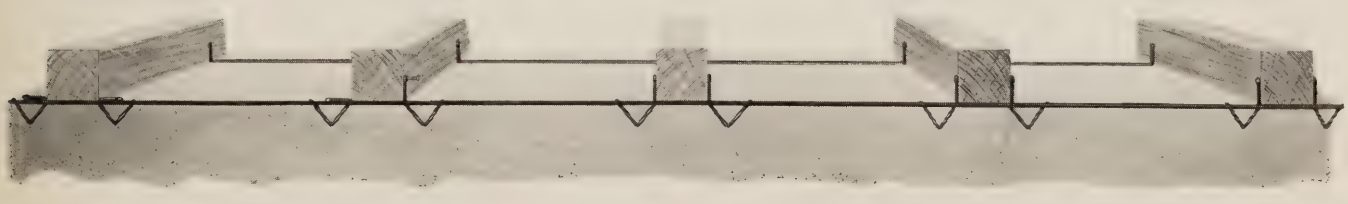
Sleeper Anchor Style "P" (parallel) lies parallel to the sleeper as illustrated above. The V-shaped anchors are of No. 10 wire and form an extremely strong anchorage. There are two No. 12 gauge wires connecting the anchors. After the concrete is set, the sleeper is placed along and on top of the anchor, and wire arms with loops are bent up on both sides for nailing.

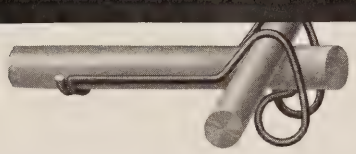
Sleeper Anchors Style "R" (right angle) are placed at right angles to the sleeper and have one No. 7 connecting wire. Its arms also lie flat and are bent up for nailing to the sleeper. The hooks on the anchors allow easy penetration in the wet concrete and form an unusually strong anchor.

Both styles of Continuous Sleeper Anchors have a complete individual anchor without a welding point on it that affects the strength of the anchor. This is obtained by welding only one wire of a double looped anchor. Even if the weld should break when the anchor is raised for nailing, the strength of the anchor is unimpaired. The only purpose of the weld is to prespace the individual anchors, and it has already served this purpose when the Continuous Anchor is placed in the wet concrete.

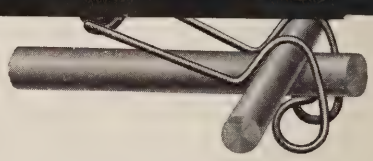
The connecting wires on both sleepers act as a float and prevent the anchors from settling too deep in the wet concrete.

Style "P" and "R" Sleeper Anchors are carried in stock for 2″ and 3¾″ sleepers with anchors spaced 12″ or 16″ on center. The Style "P" comes in lengths of approximately 5′; the Style "R" in 4′ lengths. Special lengths and spacings in either type can be obtained.





Universal Tie Chair



Patented January 30, 1917

UNIVERSAL TIE CHAIRS are made of high carbon spring wire, so constructed that they tie the bars and space them from the forms as well. This Universal Tie Chair enables you, without additional cost, to observe order and system in the placing and tying of reinforcements. Only two sizes required for fourteen different combinations and sizes of bars.

Size No. 1—For tying and supporting any two intersecting bars, the combined diameter of which is not greater than 1 inch, as follows: ½x¼, ½x⅜, ½x½, ⅝x¼, ⅝x⅜, ¾x¼ inches.

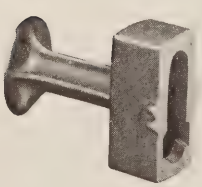
Size No. 2—For tying and supporting any two intersecting bars, the combined diameter of which is not less than 1⅛ inch nor more than 1⅜ inches, as follows: ⅝x½, ⅝x⅝, ¾x⅜, ¾x½, ¾x⅝, ⅞x⅜, ⅞x½, 1x⅜ inches.

These Tie Chairs are packed in wooden boxes of 500 each, which weigh 38 lbs.
No broken lots will be shipped.

Universal Inserts

UNIVERSAL PRESSED STEEL AND MALLEABLE INSERTS are used wherever inserts are required for shaft hangers, sprinkler systems, plumbing and heating systems, etc. The use of inserts placed into concrete construction saves time and labor, and eliminates delays in making the building ready for occupancy. There is a style and size of Universal Insert for every requirement.

Universal Malleable Inserts (Adjustable)



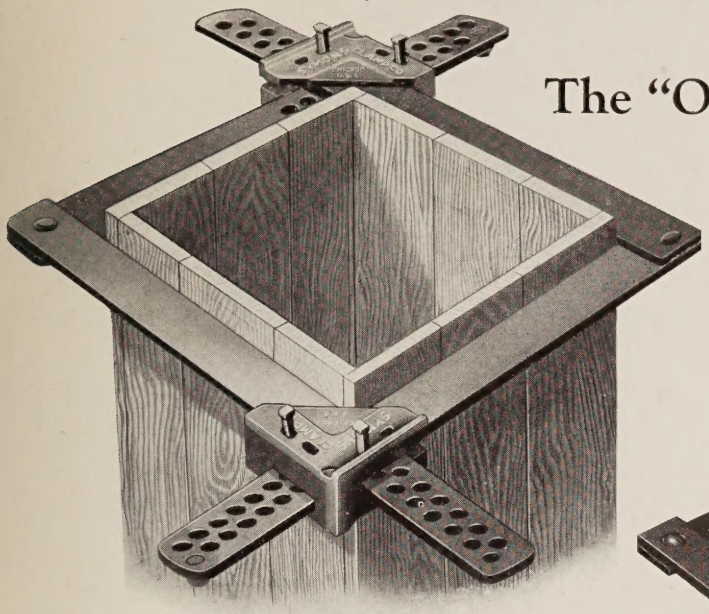
Universal Malleable Inserts are made of the highest grade of malleable castings. The bolt is adjustable the full length of the slot, because of the design and position of the notch through which the nut or bolt-head is inserted. Notches on both sides of the casting provide for nailing to the form. They are made for bolts from ⅜" to ⅞" in diameter.

Weights

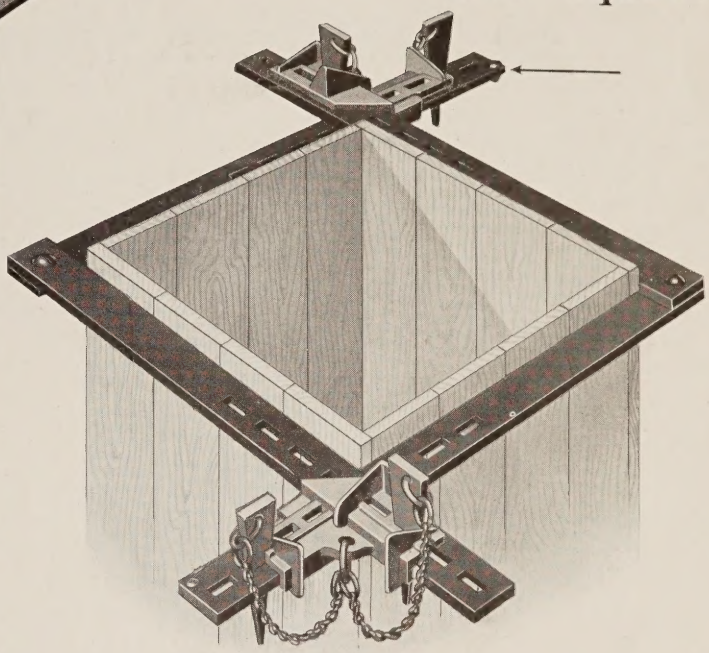
⅜"....60 lbs. per 100 pieces
½"....70 lbs. per 100 pieces
⅝"....75 lbs. per 100 pieces
¾"....90 lbs. per 100 pieces
⅞"....100 lbs. per 100 pieces

Symons Column Clamps

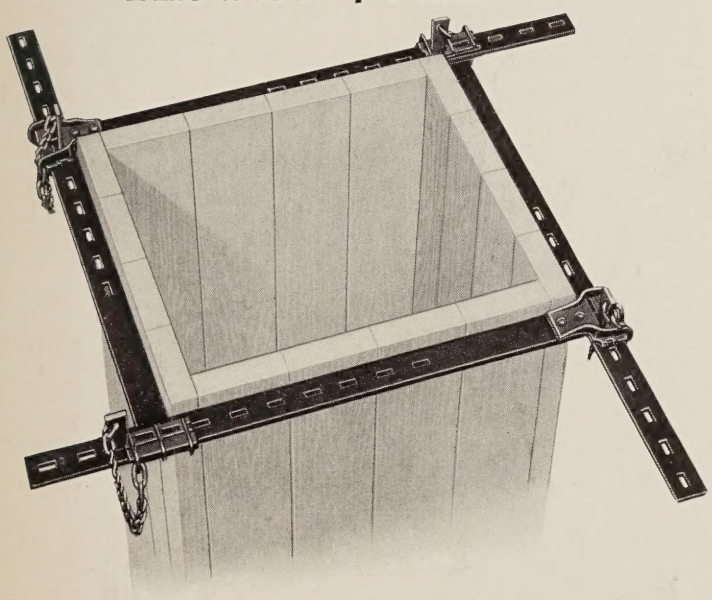
The "Old Reliable"

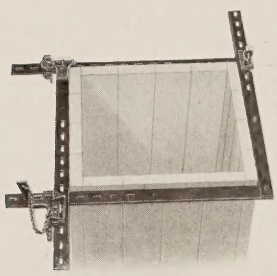


The New Ever Square



The New 4-Piece





The Symons 4-piece clamp used with the new Ever Square column clamp gives one side free from projections, an advantage in tying columns close to walls or outside columns where the building is to be closed in temporarily.

Description and sizes given on following page. All styles of Symons Column Clamps are rented or sold. They are rented with a 90-day purchase option. Paid rentals apply on purchase.

The "Old Reliable"

The Standard of Contractors for Years

The Symons "Old Reliable" column clamp has been the standard with contractors for years. Nearly every building project of any size in the country in the last fifteen years has used them. It has the features that contractors want, the cost-cutting advantages that have been tested, in service, the same features that have been put into Symons two new wedge-type clamps. The two pairs of pivoted chrome manganese steel arms are identical. The clamp cannot be set wrong. Rivets prevent brackets from slipping off. Only one tool, the tightening lever, is required. The pins give an absolute lock and the clamp cannot loosen.

The New "Ever Square" Column Clamp

The one-piece 90° angle bracket on the new "Ever Square" column clamp positively and automatically squares the column. Both units of the "Ever Square" are identical. There's no danger of unmated brackets, no possibility of setting wrong. Rivets prevent brackets from slipping off the arms and being lost, and wedges are chained to brackets. Bars are of chrome manganese steel, strong and light, brackets of tough malleable iron. Adjustment is easily and speedily made to a fraction of an inch. Like the 4-piece clamp, the only tool needed is a carpenter's hammer. Quick to set up, quick to take down, the "Ever Square" column clamp makes real savings in column costs.

The New Symons 4-Piece Column Clamp

The new Symons 4-piece column clamp has a range of adjustment 3 inches to 6 inches larger than any other clamp. You can usually clamp up all the column forms on the job with one size of this clamp.

It cannot be set wrong, for either side is "right side up." A carpenter's hammer is the only tool needed for setting up or taking down. There are no detachable parts to be lost and cause delay. Wedges are chained to arms. There are no dead spots. Adjustment to the smallest fraction is easily made; no amount of vibration will loosen the wedges. There is no column clamp that can be put on or removed more quickly than the Symons 4-piece.

Sizes and Specifications

Old Reliable Column Clamp

Size of Clamp, Inches	Arms Made of Chrome Manganese Alloy Steel Width, Thickness, Length. Inches	Size of Columns (Over All), including forms (square or rectangular) for which Clamps are Suitable, Inches	Weight
36	2x5/16x36 long	29x29 down to 10½x10½	25 lbs.
48	2½x5/16x48 long	40x40 down to 16x16	42½ "
60	3x5/16x60 long	52x52 down to 27x27	62 "
Specials			
48x72	3x5/16x72 long Reinforced	38x62 down to 12x40	80 lbs.
72x72	3x5/16x72 long Reinforced	62x62 down to 40x40	94 "

Ever Square Column Clamp

36	2x5/16x36 long	29x29 down to 10½x10½	29 lbs.
48	2½x5/16x48 long	40x40 down to 16x16	46 "

Symons 4-piece Column Clamp

36	2x5/16x36 long	33x33 down to 11x11	30 lbs.
48	2½x5/16x48 long	43x43 down to 14x14	50 "

Printed in U. S. A.